NATIONAL CONVENTION AND WORLD'S FAIR NUMBER.

Telephony.

VOLUME VIII. NUMBER 3.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

$1.00 PER YEAR. 10 CENTS A COPY.

COPYRIGHTED, 1904. ALL RIGHTS RESERVED.

CHICAGO, SEPTEMBER, 1904.

PUBLICATION OFFICE: 301-336 MANHATTAN BLDG.

THE W. G. NAGEL ELECTRIC COMPANY
MANUFACTURERS
"READY" PAY-OUT REELS
520 ADAMS ST TELEPHONE SPECIALTIES AND SUPPLIES TOLEDO, O.

E. W. HAMMER, Pres. & Treas. H. J. MINNEMICK, Sec. & Gen'l Sup't.
The General Engineering Co.
Consulting and Contracting Engineers.
Telephones—Electric Light—Power Transmission.
Suite 1112, 135 Adams Street, CHICAGO.
Long Distance Telephone Central 478.

CHAS. G. STEVENS CO.
BRIGHT COLD ROLLED AND COLD DRAWN
NORWAY IRON, MAGNET STEEL
Cold Drawn Steel Rounds, Flats, Square, Hexagons.
COLD ROLLED STRIP STEEL
LARGE STOCK ALWAYS ON HAND
58-60 South Canal Street, CHICAGO

H. M. DEAVITT
Practical and Consulting Chemist
159 La Salle Street, Chicago
Accurate analyses made of Norway Iron, Magnet Steel, Insulating Waxes, Rubber, Cotton, Silk and all material used in electrical manufacture.
Experimental work of every description pertaining to telephone construction.

WRITE FOR OUR COMPLETE CATALOGUE AND PRICES OF
TELEPHONE MATERIAL
DEARBORN ELECTRIC COMPANY
122-124 WEST JACKSON BOULEVARD, CHICAGO

CHICAGO TELEPHONES SATISFY

Crowe Metal Mfg. Co. CHICAGO.
WHAT? NAME PLATES
BEST QUALITY — LOWEST PRICE.

New York Insulated Wire Co.
TELEPHONE WIRES AND CABLES
SAN FRANCISCO. BOSTON
CHICAGO. NEW YORK.

J. H. Bunnell & Co.
20 Park Place NEW YORK
Manufacturers of
HIGH GRADE
Telegraph Apparatus
Instruments, Switchboards, Condensers, Galvanometer Coils, etc.
Everything for Composite or Telegraphone Working.
Catalogue Free.

MATHIAS KLEIN & SONS,
83 W. VAN BUREN ST., CHICAGO.
MANUFACTURERS OF
Linemen's Construction Tools.
WRITE TO-DAY FOR OUR
"RED BOOK" It is of pertinent interest to every telephone man and will be sent free upon request.

JONES & WINTER
INDEPENDENT
Telephone Engineers and Contractors
1259 Monadnock Bldg., CHICAGO, ILL.

M. B. AUSTIN & CO.
56-58 West Van Buren St., Chicago.
THE TELEPHONE SUPPLY HOUSE
STANDARD SUPPLIES.
LOW PRICES. PROMPT SHIPMENTS.
Write to-day for Catalogue and Prices.

McROY CONDUITS—BRAZIL, INDIANA

WRITE FOR SAMPLE STATING SIZE USED IN YOUR TRANSMITTER.

THE CRYSTALIZED CARBON CO.
363 West Monroe St., Chicago.

MANUFACTURERS OF

A Strictly High-Grade Granular Carbon for Telephone Transmitters.

We guarantee this carbon to hold its life and efficiency indefinitely. It has been in use for over five years by the leading manufacturers, and not once have we received a complaint.

If you are looking for the best, try it and be convinced of its merit.

The Indiana Rubber & Insulated Wire Co.

Manufacturers of

Insulated Wires and Cables

JONESBORO, : IND.

SAMUEL G. McMEEN. KEMPSTER B. MILLER.

TELEPHONE ENGINEERS

1442-1443 Monadnock Block,
CHICAGO.

Complete Plants Laid Out. Construction Supervised.
Expert Examination. Advisory Reports.

Alphabetical Index to Advertisers

American Conduit Co. 98
American Electric Fuse Co. 20-21
American Elec. Telo. Co. 7-100
American Electric Works 100
American Machine Telo. Co. ... 17
Andrae Sons Co., The Julius. . 98
Austin, M. B. & Co. 1
Automatic Electric Co. 41

Baird Mfg. Co. 37
Barry & Benton 92
Beidler & Co., Francis 93
Belden Mfg. Co. 100
Beltrami Cedar & Land Co. ... 89
Benedict & Burnham B. & C. Co. 100
Bissell Co., F. 30
Blake-Signal & Mfg. Co. 99
Blakeslee Forging Co. 94
Bowersock, Fred H. 48
Brooks Co., Hall L. 88
Bunnell & Co., J. H. 1
Butterfield, J. F. 100

Camp Co., H. B. 99
Carney Bros. Co. 87
Central Electric Co. 35
Central Telo. & Electric Co. ... 10
Chicago Fuse Wire & Manufacturing Co. 14
Chicago Telo. Supply Co. 1-3-5
Chicago Insulated Wire Co. ... 100
Chicago Writing Machine Co. .. 10
Clement, Edward E. 43
Clinton Stamping & Elec. Co. . 99
Commercial Elec. Supply Co. .. 16
Century Telo. & Const. Co. 11
Columbian Electrical Co. 6
Conover, Geo. W. 100
Controller Co. of America. 33
Cook, F. B. 40

Crawfordsville Wire & Nail Co. 32
Crowe Metal Mfg. Co. 1
Crumb & Co., W. H. 100
Crystallized Carbon Co. 2

Dean Electric Co. 12-13
Dearborn Electric Co. 1
Deavitt, H. M. 1
Doubleday-Hill Electric Co. ... 34

Eagle Generator Co. 97
Electric Appliance Co. 31
Eureka Electric Co. 36
Ewing-Merkle Electric Co. 38

Faller Automatic Tel. Ex. Co. 83
Farr Telephone & Construction Supply Co. 38
Fibre Conduit Co. 100
Fowler, John H. 93
Frost Cross Arm & Lbr. Mfg. Co. 48

General Engineering Co. 1
Greenbrier Pole Co. 92
Guarantee Telo. & Equipment Co. 30

Hallett Iron Works 24
Harvard Electric Co. 48
Hemingray Glass Co. 8
Hodge-Walsh Elec. Engr. Co. . 99
Holt Lumber Co. 87
Holtzer-Cabot Elec. Co. 4
Houston & Liggett 93
Humbird Lumber Co. 84

Illinois Electric Co. 24
Illinois Electric Specialty Co. . 46
Indiana Rubber & Ins. Wire Co. 2

Indiana Steel & Wire Co. 14
International Creosoting & Construction Co. 91
International Telephone Manufacturing Co. 100

Jones & Winter 1

Kellogg Switchboard & Supply Co. 44-45-90
Kemp, Roy W. 48
Klein & Sons, Mathias 1

Lindsley Bros. Co. 84

Matthews & Bro., W. N. 91
McMeen & Miller 2
McRoy Clay Works 1
Middleton & Co., J. W. 100
Miller Anchor Co. 18
Monarch Electric & Wire Co. . 8
Monarch Telephone Mfg. Co. . 23
Moon Mfg. Co. 22
Mountain State Electrical Co. . 22
Mueller Company, Wm. 93
Murdock & Co., W. J. 99

Nagel Elec. Co., W. G. 1-32
Nash & Co., Geo. 99
National Wire Corporation ... 34
Naugle Tie Co., E. E. 86
N. Y. Insulated Wire Co. 1
North Electric Co. 25
Nungesser Electric Battery Co. 30

Pendleton & Gilkey 90
Pignolet, Louis M. 16
Pittsburg & Lake Superior Iron Co. 89
Plume & Atwood 99

Pontiac Engraving Co. 98

Raber & Watson 91
Roebling & Sons Co., John A. 94
Rogers, Oscar Wentworth. 26-27-28-29
Runzel-Lenz Electric Mfg. Co. . 4

Sand Point Cedar Co. 88
Seaman & Co., W. S. 18
Spies Electric Co. 48
Standard Telo. & Electric Co. . 19
Standard Underg'd Cable Co. . 48
Stanton, L. W. 100
Sterling Electric Co. 47
Sterling & Son, W. C. 93
Stevens Co., Charles G. 1
Stromberg - Carlson Telephone Manufacturing Co. 42-43
Sumter Telo. Mfg. Co. 9

Taylor, Lee J. 94
Telephone Books 94-96

Veeder Mfg. Co. 22
Vought-Berger Co. 15

Wabash Railway 95
Want Advertisements 94
Warner Electric Co. 6
Wesco Supply Co. 48
Western Electric Co. 92
Western Telephone Mfg. Co. ... 39
Wheeler Electric Const. Co. ... 100
Williams-Abbott Elec. Co. 16
Williams Telo. & Supply Co. .. 34
Wittenberg Cedar Co. 86
Worcester Co., C. H. 85
Wright Bros. 85

Yesbera Mfg. Co. 14

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

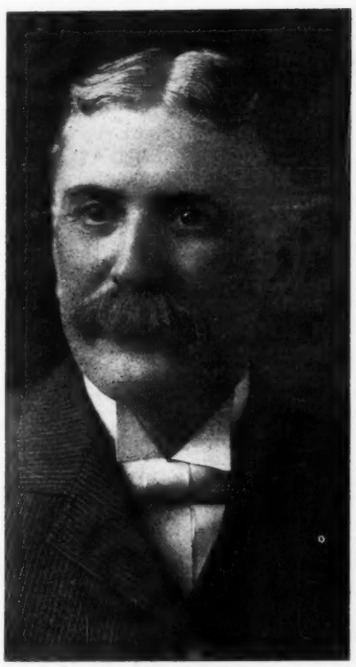
VOL. VIII. CHICAGO, SEPTEMBER, 1904. No. 3.

National Convention at St. Louis

UNITED we stand, divided we fall." The truth of this sentiment has been proved by every year of American history. In business, as in national affairs, the same rule holds true. The newspapers are filled with the organizations of capital which we call "trusts," and with the organizations of labor known as "unions." Organization is the spirit of the times. Practically every business or trade is represented by an official body, which speaks with authority for its members.

In hundreds of lines of business the trade organization has been perfected into an active business machine, devoting itself to the betterment of trade in general, and of every individual member in particular. Some associations have been formed for mutual protection from threatened danger; some for the promotion of trade in a larger sense; some for the settlement of constantly arising differences between co-related interests. Some even have had no greater object than the promotion of a better acquaintance among the members. But, whether organized for mutual protection, for the arbitration of dispute, for social purposes or for any other reason, no society ever has succeeded without first a definite object, and second an ardent pursuit of that object until attained.

The Independent telephone business in no way differs from any other American industry. It contains the elements of the manufacturers, the jobbers, the construction men, the engineers and the operators. Its interests are served by trade papers devoted exclusively to Independent telephony, and it is proper and just to say that the men interested in the business are above the average business man in point of industry, shrewdness, enterprise and sense.



HUGH DOUGHERTY,
President National Association.

But practically alone among *great* and *broad* industries, Independent telephony has failed to organize itself nationally for its own betterment. In the early stages of Independent telephone development, the necessity arose for a broad alliance to defend the business from the aggressive patent claims of the Bell company. The Independent Telephone Association of the United States was organized to carry on the work of defense. Its hands were supported by manufacturers and operators alike, in the life and death struggle with the monopoly. Its victory at every point is a matter of Independent history.

It is strange, after studying the record of the patent battles, that there should have been, ever, a backsliding from the organization principle. But there was, decidedly. Disaffection and discontent, jealousy and ambition combined to defeat what should have been the culminating triumph of Independent organization.

The patent danger over, the apathy of indifference settled down like a chilling fog upon the future of the national association. Its conventions were poorly attended, and its activities were blamed, while its inactivities were still more severely condemned.

It is not in the American character to be passive. We are not a nation of do-nothing grumblers. Independents who felt dissatisfied with the work of the national association, and other Independents who realized the urgent crying needs of the business, began the organization of the dozens of state and local associations which are to-day doing such a large amount of good, each in its own field. The immense benefit which these state and local organizations have conferred upon Independent telephony cannot be overestimated. They have bridged the gap of difficulty with the framework of necessity, and have enjoyed the benefit of their own work, while at the same time, conferring a general benefit on others.

But the time has come when no state or other sectional association can fulfill the whole destiny of national telephony. The best minds of the business see it, and the best energies of the best men in the field are working together on the problem. Practically everybody is agreed that there should be a great national association of all Independents. But how such an association should be organized, and what work should be set for it to do, no one man can say. It is certain that it should be organized, and as equally

certain that, to be successful, it must organize itself, that is, be a movement from within, representing the whole industry, and taking into consideration the rights and needs of every part.

The opportunity to realize what has never before been possible in the way of a great national association of Independents will be presented at St. Louis on September 21, 22 and 23. The Independent Telephone Association of the United States has called its convention to meet at that time, with headquarters at the "Inside Inn," World's Fair grounds. The great exposition will be sufficient inducement in itself to bring a large attendance. But combined with the pleasures and the glories of the World's Fair there is also offered this oportunity for all Independents to "get together." That should be a larger reason for coming than any other.

The committee on arrangements and programme has selected the "Inside Inn" as headquarters, believing that it will result in large attendance at all convention sessions. The hours of meeting will be from 10 to 1 each day, giving to all those who come the entire afternoon and evening to spend in seeing the Fair. The entertainment of every delegate will not be forgotten, and a programme, including addresses by men of national prominence, has been arranged.

It is planned, however, that the convention shall be a "free for all" affair. No cut and dried programme or slate will be made up. The idea is to get a large attendance and to let the people do the rest. If a truly representative attendance can be secured, it will be possible, for the first time in Independent history, to get an expression of Independent sentiment. That expression of sentiment will crystallize into some form of action which will mean benefits to all Independents. There is no operating company which has not had to face a thousand and one vexed questions which only concerted wisdom and experience can solve. There is not a stockholder in an Independent telephone company who would not benefit by an improvement in Independent finances. There is not an engineer who cannot learn something from others of the same class. Even the manufacturers should be able to find a common ground upon which they all can stand in the interests of the betterment of apparatus and the standardization of designs.

Every element of the industry should receive its proper recognition. Every weakness should be overcome, every strength developed. All that is necessary is for *everybody* to do his part. Thousands can do easily what dozens would fail in trying to do. Each Independent will benefit thereby.

To every man, woman and child who is interested in the future of Independent telephony, we would send this message:

"Come to St. Louis on September 21, 22 and 23. You are assured of the best time of your life, and while finding enjoyment, you can have the satisfaction of knowing that you are doing something for the permanent benefit of yourself and your fellow Independents. Come prepared to give at least three hours of your time each day to the convention sessions. The World's Fair will tire anyone completely out who tries to go sightseeing all day long, and the afternoons and evenings are the best times to see the wonders of the Exposition buildings and grounds. Hotel accommodations for 500 have been reserved. Send in your name to Frank G. Jones, Secretary, 50 West Jackson Boulevard, Chicago, Illinois. He will tell you all the plans.

"If you don't come, you will never forgive yourself for the lost opportunity of a lifetime. If you do come, you will remember it as long as you live. Everybody *should* come. Almost everybody *will*.

"Come yourself, and bring some ideas with you. Talk them to other Independents, talk them in the convention hall. Come, all Independents from everywhere."

ARTIFICIAL PRESERVATION OF WOOD.

That strangely effective chemical talisman called creosote is revolutionizing certain natural phenomena. For instance, it is imparting to wood a longer lease of life than can be claimed for steel. It interposes a bar to the ravages of decay many fold further reaching than is provided by nature. In the vicinity of New Orleans, on the Louisville & Nashville railroad, creosoted piles driven in 1876 for the support of steel superstructure are in a good state of preservation, while the steel bridges borne by them have lately been renewed. After calling attention to this the *Lumber Trade Journal* says:

"Here is a conservative factor that in the light of a decimated forest supply and consequently higher prices, will commend itself to timber and tie consumers as a way out of a dilemma. It will also serve to restrict a rate of consumption, constantly growing into proportions threatening the ultimate extinction of the wood supply. The use of wooden piles is at best a sort of vandalism—the robbery of forests of an important part of them not yet otherwise merchantable and which left undisturbed would some day attain to a much more valuable standing."

Reverting to the Louisville & Nashville incident, it appears that the treated piles in question have now been in place twenty-eight years, but as they still are in a perfect state of preservation, it is impossible to say how much longer they will continue so. From two to twelve years is accounted the range of life to which such material in the natural state may attain, so that taking an average of, say, seven years, the preservative process, as shown, prolongs the life of the stick, at the very least, fourfold; how much more it may do so, remains to be demonstrated. Counting the cost of the raw material with that of the treatment added and the ultimate minimum gain is very easily arrived at. There can be no question about the soundness of the treating policy.

JAPANESE SCOUTING WITH TELEPHONES.

Scouting with the aid of the telephone has become one of the features of modern warfare, and is now being made use of by the Japanese. Two scouts proceed from the lines toward the enemy. One, the observer, is a skilled army officer, who makes his observations, which are transmitted back to headquarters through a telephone line paid out from a reel carried by an electrician of the signal corps. A ground return is used, the ground being made by thrusting a bayonet or hatchet into the earth and attaching one end of the line to it. The electrician carries a battery on his back. He also makes the connections and does the talking. A special conductor is used, which will stand rough usage. In this manner a scout may be able to stay out a long time and give valuable information without being obliged to make a number of hazardous trips to the front.

CUPID ON PARTY TELEPHONE LINES.

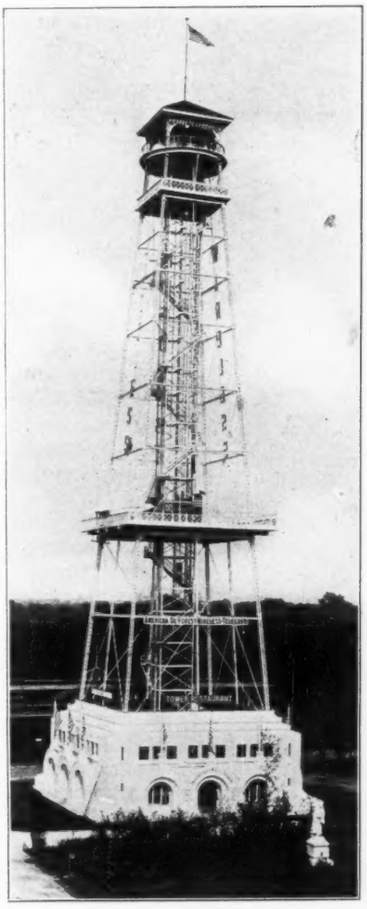
A curious mixture of telephony and a lovers' quarrel has just been brought to public attention at Marion, Ohio, where a rejected lover has been placed under bonds to keep the peace. Orrin McClelland, according to a dispatch from Marion, for five years paid attentions to Miss Florence Bish, of Longville. She discarded him finally for Sidney Northrup. The old and new lovers were on the same party line, and when Florence made love to Sidney over the wire Orrin, the old lover, caused trouble by breaking in on the tender conversations and repeating among the townsfolk what he had heard. This led to violence among the parties concerned, and some of the encounters were characterized by the use of clubs, pitchforks, etc. The courts had to be appealed to, with the result above stated.

Wireless Telegraphy at the Fair

J. C. KELSEY.

WORLD'S FAIRS have ever marked the beginning of some of our greatest utilities. The Centennial Exposition showed the arc lamp and the telephone. Gas lighting was then the world's unrivaled illuminant. The Chicago Fair showed the incandescent lamp on a grand scale, and revealed the power and utility of electric traction. The St. Louis Fair has slighted none of the past triumphs, and has added to them the wireless communication of intelligence.

It is well known that wireless telegraphy on the ocean is at a distinct advantage over that confined to fresh water lakes, for the salt water is an aid to long distance communication. And it looks more feasible and useful to the public—the idea of communicating across expanses of water—because there is no way of maintaining lines as on land, and then the moving objects add to the mystery and wonder of the feat. But on land there is a use for the wireless communication, and the greatest difficulties are met in the accomplishment. At present St. Louis is the headquarters of the land experimenter and wireless towers are legion. There is a tower at Chicago, but the greatest efforts of the World's Fair station have not succeeded in signaling across this space of 250 miles. So there has been a relay station, or tower, built at Springfield, Illinois, which enables the DeForest people to carry on communication with Chicago. The reader can be assured that this 125-mile communication over land is the greatest distance yet accomplished.



DE FOREST WIRELESS TELEGRAPH STATION.

The tower at St. Louis is located on Art Hill, the highest elevation on the fair grounds. This wooden mast stands 210 feet high and is supported by suitable guys. At the top of the mast is a forty-foot cross arm. Suspended at each end of the cross arm is a horizontal wire, which supports twenty vertical wires. These wires are called antennae, or aerial capacity, or intercepting wires. These vertical wires, or aerial wires, are each 250 feet long, and would touch the earth were it not for a bowing out process, by means of cord spreaders. These wires enter the roof of the building in two halves of ten wires each. Within the building, which has an area of 800 square feet, the visitor sees only an operating table, relay keys, and receiving instruments. The transformer, condenser and other adjuncts are concealed in a separate room. But through a window, however, one may see the fearful brilliancy of the enormous spark, which accompanies every signal. This spark is so muffled that it is hardly heard outside the building. But when the muffled doors are opened, one hears a roar which reminds one of Port Arthur these days.

A great deal has been said and written about the tuning of messages, so that secret messages could be sent without danger of being interpreted, or interfered with. And some of the readers have heard of the scientific gentleman who interfered with a great English scientist's alleged attuned wireless exhibition, and spelled out the word "Rats!" This would tend to make the mind suspicious of this word attuning, and lay it to the desire of the promoters to make the wireless proposition more alluring to the financier. And there have been reports of wireless talking over spaces of great distance, and one man promised to talk from Muncie, Indiana, to Chicago. He must have just discovered that the ordinary long distance company had just connected the two cities. But from a wireless standpoint, it will be long after the Muncie man is dead that anyone will talk from Muncie to Chicago, or any other place of that distance.

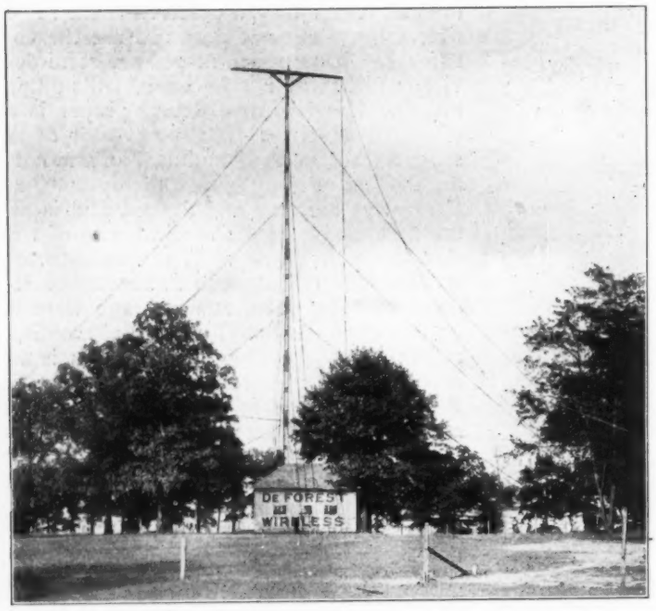
There is a method of attuning, and it is a reasonable, rational proposition. I do not mean that the messages cannot be intercepted and read, but that one message may be received at the same station, while another, or even yet another, is received at the same time. Dr. DeForest does not use the coherer, but has a much more successful device, which will not be explained in this article. His receiving device proper is a telephone receiver. If the operator at A sends a message to C, and uses an alternating current of sixty cycles, the operator at C receives the dots and dashes, and is all the time aware of the musical note of the sixty-cycle frequency. If the operator at B also sends a message to C, he would seriously interfere with A's message were it not for the fact that B uses an alternating current of 133 cycles, which makes it an entirely different note in the receiver at C. But the operator at C cannot take both messages without trouble, so a second operator puts his receiver in series with the first operator, and he listens to the dots and dashes of the 133-cycle current, while the first operator takes care of the sixty-cycle note.

A third message could be sent, if another frequency were used and a third operator at the receiver station put his receiver in series with the other two. If several of these frequencies could be superimposed, then a musical instrument of small range could have its notes transmitted great distances. But as yet that has not been done. One does not have to think hard to realize the difficulty of superimposing the countless frequencies of the voice, when so far only two or three frequencies are conveniently handled.

But all this digression does not detract from the alluring and successful transmission of intelligence without wires. One cannot help but admire the enterprise and courage of the DeForest company. They have ten operating sets on the fair grounds, and have seven distinct and separate stations, aggregating a cost of over $100,000. Most prominent of all the towers is the DeForest observation tower, at the entrance of the Orleans Plaza. It is 300 feet high and is equipped with two express elevators. The elevators are in constant operation, and the steady stream of visitors to the top of this tower gives evidence of the popular interest in wireless telegraphy, and appreciation of the opportunity to obtain a birdseye view of the fair grounds. The wireless telegraph tower station is placed upon the 100-foot platform, far above the tops of the buildings and overlooking the expanse of Forest Park. The

walls of this station are made of glass, and visitors are afforded a fine view in the direction of the city. The smoke and dust of the great city hide the mast from public view, but those downtown stations are not hidden from the influence of the outgoing waves, for the St. Louis *Post-Dispatch* and the St. Louis *Star* receive daily news service from this station. From 3,000 to 5,000 words are daily transmitted through this space at the rate of twenty to thirty-five words per minute, detailing the news that their reporters collect from the ever-teeming grounds. The downtown operators are located in the press rooms and hand over to the typesetter copy direct from the wireless station on the fair grounds.

The question is often asked, What power does it take to send a message for 100 miles overland. Let us see. The power supply to this observation tower has 500 volts pressure, giving direct current. A seventy-five horse-power motor-generator transforms this pressure to 240 volts, which furnishes current to the elevator motors. On this same



DE FOREST WIRELESS TELEGRAPH TOWER.

240-volt circuit is a motor, which drives by belt a two kw. or 2½ horse-power alternating generator, whose output is 110 volts pressure, and twenty amperes at sixty cycles frequency. Directly in this circuit is the key and the primary of the sending apparatus. One might imagine the fierce spark from the deliberate make and break of such a circuit, but such a spark is easily diminished by the proper amount of capacity in form of condensers about the sending key. A transformer raises this voltage from 110 to 20,000 volts. The winding of the secondary is placed in series with a condenser having a capacity of .013 microfarads, a spark gap, a helix, and the antennae, or aerial capacity.

There have been filed with our government over 800,000 patents. Of all these, but seven have been placed on exhibition in the government building. Among the seven is the DeForest patent, and its popularity is much evidenced by the crowds that daily inspect it. The United States Signal Corps have two DeForest sets in operation, and messages may be received from the observation tower or the patent office. The government building display brings out a peculiarity in connection with the transmitting apparatus. The power is furnished at twenty-five cycles alternating. As the induction coil, or transformer, is of the open coil type, it will not operate well on the low frequency of twenty-five cycles. A Wagner motor-generator is called into play, whose capacity is one kilowatt, something more than one horse-power. The motor-generator converts the twenty-five cycle to sixty-cycle current at 110 volts pressure, which is led directly to the key, as in the case of the observation tower.

One particularly noticeable thing is the fact that the steel structure of the observation tower absorbs at least fifty per cent of the energy of sending or receiving. However, the Springfield distance has been nicely accomplished in spite of the steel tower.

Thirty-five hundred incandescent lamps illuminate the observation tower at night. It stands out conspicuously, and even overtops Festival hall. That it adds much to the beauty of the illumination may be seen from the picture showing the tower at night.

In addition, the DeForest company has installed stations in the Electricity and Transportation buildings, in which their wireless telegraph automobiles are shown. These automobiles have been very successfully used in sending stock quotations from the New York curb to the brokers' offices nearby. They took part in the Transportation day parade, and were in constant communication with the various stations.

Never has an industry or scientific utility ever started out with such auspicious beginning, if the appreciation and interest of the millions of visitors at the Fair may presage anything. The DeForest Wireless Telegraph Company has been conscientious, and has not spared a point in the complete demonstration of its apparatus, to the investor public and all alike. Surely, that is a commendable spirit, and deserving of much credit.

TELEPHONE TRAIN DISPATCHING.

On the electric (trolley) railroad from Rochester, New York, eastward to Geneva, forty-nine miles, all train orders are sent by telephone and the cars of the company, which have telephones in the motorman's box, are so equipped that connection can be made with the telephone line without stepping out of the car. On this railroad line, at least for a part of its length, eighteen trains, or cars, are run, each way, daily, and meeting points, as fixed in time-table, are absolute; trains running in opposite directions wait indefinitely at schedule meeting points for opposing trains of the same class. The train-order rules and forms are similar to those of the American Railway Association, orders being written and copied on form "31." The conductor alone signs the order, the motorman not be required to do so. Every car before starting from a terminal reports to the despatcher, and if there are no orders receives a clearance card. When a telephone order is sent to a car it is receivd by the motorman, as spoken over the wire, and by him written out and handed to the conductor, who then repeats it back to the despatcher. All trains are required to get orders (or a clearance) at every station where there is an operator.

The Street Railway Journal, from which we take these notes, shows a drawing of a "fish-pole" arrangement for making connection between a car and the telephone wires strung along the road. Every half mile there is a telephone-box attached to a pole and this, as before stated, can be reached without leaving the car, the pole being close to the track; but at points between boxes a conductor who may wish to telephone to the despatcher can use the "fish-pole." The two wires of the telephone circuit are the lowest on the line poles, and hang one above another on the side next to the track; and the fish-pole has two hooks, one above another, so as to connect with both of these line wires at the same time; and a loose spiral spring in the end of the pole causes the hooks to rest with some pressure on both wires at the same time, one hook on each, thus, by two wires in the fish-pole, connecting both the positive and the negative currents to the telephone on the car.

Exhibits at the St. Louis Fair

EXHIBITS of a wide variety pertaining to electricity in its multitudinous applied forms are to be seen in the Palace of Electricity at the St. Louis World's Fair, but no feature of this mammoth and magnificent display has attracted more universal attention or elicited more favorable comment than the exhibits made by the numerous telephone manufacturing and supply concerns of the United States and their kindred interests. In itself it has been a great school of education to the countless thousands who have from day to day viewed these interesting exhibits and received enlightenment on the subject of telephony in all its phases, as well as gaining an intelligent idea as to the scope and meaning of the great Independent telephone movement.

The various displays made by manufacturers and supply men who look to the Independent field for their trade are creditable in the highest degree, and do honor both to the exposition and to the cause which they represent and are putting forth their best efforts to advance. We would advise every one of our readers who visits the fair to spend several hours among the telephone exhibits, as it will be time and effort well directed; and to those engaged in the telephone work its benefits are too evident to need even commenting upon.

The exhibitors in the telephone section of the fair are entitled to unstinted praise for their enterprise in desiring to be represented at this greatest of world's expositions, even though the expense entailed in nearly every case reached thousands of dollars and gave no promise of immediate financial returns. In order that our readers may know more of these exhibits and exhibitors, we herewith present an illustrated account of the same, which is sure to be of interest to all who peruse it:

WESCO SUPPLY COMPANY.

Block No. B in the Palace of Electricity at the exposition is occupied by the co-operative exhibit of the Wesco Supply Company of St. Louis, and a number of the leading apparatus and electrical material manufacturers of the country, whose products are sold by the above concern throughout the great south, southwest, Mexico and Cuba. Taken as a whole, this exhibit, considered from a commercial and practical standpoint, ranks among the best in the electrical section of the fair, owing to the character of the machinery displayed in operation and also the adaptability of the latest inventions and devices for the construction and maintenance of lighting and power plants, electric railways and telephone exchanges—everything tending to produce the effect of dispelling the doubts which often arise in the minds of electricians concerning new apparatus, until they can be convinced by practical demonstration of the advantages, economy and worth of such devices.

All of the machinery in operation comes under the specifications as to size, capacity, etc., in general use by the average plants and exchanges throughout the territory which the Wesco Supply Company covers with its twelve road salesmen, and a visit to the exhibit will prove of great interest and much benefit to all who are concerned in the electrical field, and the efforts of the manufacturers to promote and improve their various products, so essential to modern business methods.

The booth of the individual exhibit of the Wesco Supply Company occupies a space in the center of the block, in which are contained a telephone switchboard with a Warner ringing apparatus and twelve of the Wesco company's telephones installed on the same number of circuits, showing their various types and also their construction and good qualities which have made them so popular. "Wesco" ceiling, desk and wall A. C. fans keep the booth and private office at a delightful temperature, and a short rest in the booth is a boon to the tired visitor during the summer months. The remainder of the Wesco exhibit consists of several of their Adams' secondary generators, shown in practical operation as a substitute for dry batteries, ringing bells, opening doors and for annunciator and telephone switchboard work. They are installed on the secondaries of

WESCO SUPPLY COMPANY'S EXHIBIT.

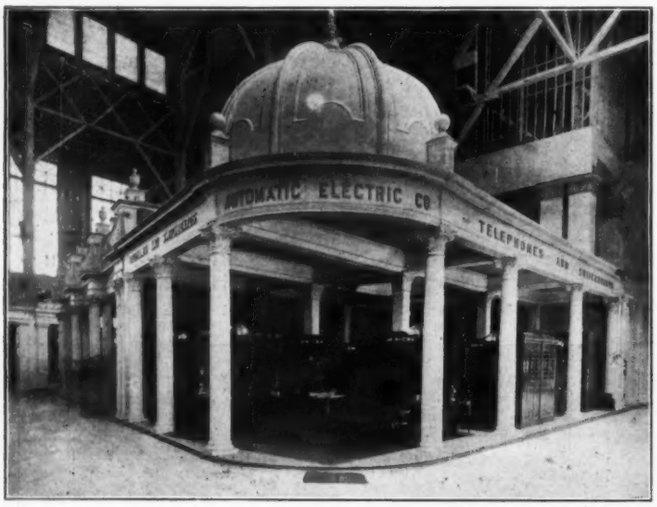
an alterating current circuit, and their consumption being only one watt, practically cost nothing to operate.

Wesco "Red Shield" and "Wesco" dry batteries, together with "Wesco" insulating tapes, complete the list of products with which this company hopes to compete successfully with other exhibitors, and also to secure the approbation of all its customers and visitors to their display.

AUTOMATIC ELECTRIC COMPANY.

One of the most attractive exhibits at the fair is that of the Automatic Electric Company of Chicago, which is nearly always surrounded by interested spectators. Occupying nearly 2,000 square feet of space, covered by a handsomely finished and equipped booth, it consists of a complete working automatic exchange of the 10,000-capacity type, with 200 stations installed. It is a model of the large automatic

exchanges which have been installed in Chicago, Grand Rapids, Michigan, Dayton, Ohio, and other cities of this country. It embraces all their special features, including a 10-station tollboard, the operator of which demonstrates the manner in which long-distance connections are given to automatic telephone subscribers. Desk, wall and booth tele-



AUTOMATIC ELECTRIC COMPANY'S BOOTH.

phones are located about the exhibit and service is also given throughout the building.

A new and novel use of the telephone is made in the department offices, where each person on the staff is supplied with an automatic telephone. In addition to the ordinary business uses to which these instruments are put, practically all the letters written by the various officers are dictated through telephones to the stenographers, each of whom is supplied with an instrument with watch-case receiver and headgear. The peculiar arrangement of the offices makes this method a great convenience, as it makes it unnecessary for the stenographers to leave their desks and

AUTOMATIC ELECTRIC COMPANY'S EXHIBIT.

prevents the incident confusion. Automatic telephones are also placed about the building for the use of the Jefferson guards, who can thus place themselves in communication with the chief of the department and with one another.

One of the most unique features of the automatic system, and one which has but lately been added, is the rotary connector. This is a sort of combination of the selector and connector switches, and is designed for use in private exchanges, or any case where several telephones are placed on one number. The switch automatically passes over busy lines and selects one of the disengaged telephones. In the event that all are in use, instantaneous notice is given by the usual method. In this way if a private branch exchange has five trunk lines on a call the rotary connector would move so as to connect with the first trunk. If, however, this is in use, the contact would move to the second, and so on until a free line is found, when the final connection would be made. It is asserted that the addition of this switch brings the automatic system to a point where it has all the elasticity and flexibility of the manual system with the added advantages of secret and prompt service.

SUMTER TELEPHONE MANUFACTURING COMPANY.

The exhibit of the Sumter Telephone Manufacturing Company of Sumter, South Carolina, located in Electricity Building, Section 14, is very complete, and a striking example of that high standard reached in modern telephone manufacture. This company, as is well known, enjoys the distinction of manufacturing all parts entering into the construction of their entire line of instruments. Its factories located at Sumter, South Carolina, are equipped with every

SUMTER TELEPHONE MANUFACTURING COMPANY'S EXHIBIT.

facility for the proper handling of its large and rapidly increasing business. The beautiful finish of the cabinet work turned out by this company, as always conspicuous in their instruments, is one of the attractive features of their exhibit, there being a number of cabinets in curly walnut, quartered oak and other woods from the native forests of South Carolina, sawed from the log by this company at their own sawmill, operated in connection with their works at Sumter.

In this exhibit quite a number of magneto and central energy telephones are shown, incorporating this company's latest designs in transmitters, receivers, hook switch, generators and other parts, all of which, as above stated, are manufactured by this company, nothing but the raw material being purchased outside. They also exhibit a field telephone, used extensively in the signal corps service of the United States government, which they have furnished with a large number of these instruments, and which may be considered as an evidence of the high standard of electrical and mechanical efficiency of the products of this company.

They also show several sections of their celebrated Sumter "Bull's Eye" express switchboard, the drop and jack of which is combined and self-contained, the shutter being automatically restored by the application of the plug. The restoring of the shutter is accomplished by means of a steel ball, which is an entirely new and ingenious arrangement,

rendering the restoring feature absolutely reliable and non-infringing.

Many of the telephones in this exhibit are equipped with this company's latest type of solid back transmitter, and their new self-contained gravity hook switch. It is said this transmitter is particularly efficient in long distance service, and adapted as well to local circuits.

By reference to cut of the hook switch, herewith shown, it will be seen that the restraining springs have a definite travel, cannot get out of adjustment, and that the trend is constantly under tension.

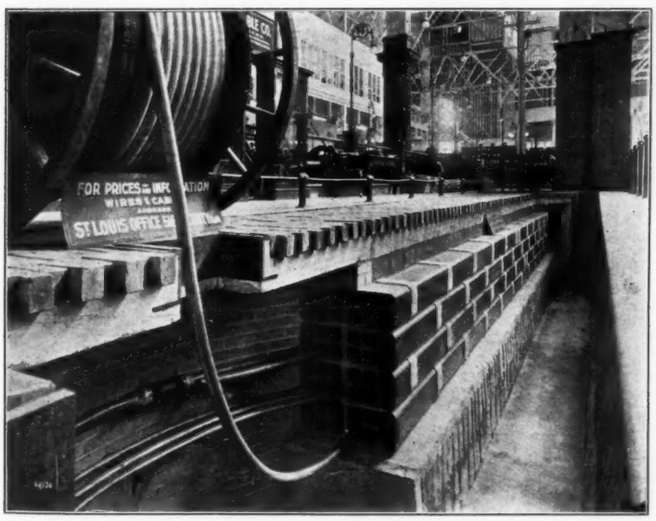
Among the new devices exhibited as attracting special attention should be mentioned their recently patented Mason multi-discharge lightning arrester, a cut of which is herewith shown, from which it will be noticed that a very ingenious and novel combination has been accomplished. The high chocking effect due to the line conductor encircling the grounding medium, and the multiplicity of discharge points favoring the dissipation of the lightning current, will be readily appreciated by all persons familiar with devices of this character. It is said that this lightning arrester is one of the most efficient protectors on the market.

Several wall stations and desk sets of their "S. T. M." inter-communicating instruments are also shown in operation. These instruments are interestingly described in a bulletin distributed by the Sumter company, showing points of relative merit. The system of hotel telephones and annunciators for inter-communication between hotel rooms and the outside city service is also a very interesting and attractive exhibit, these several systems being installed and shown in operation.

L. G. LeBourveau, who will be remembered as having been the traveling representative of the Sumter Telephone Manufacturing Company for several years, and now connected with the Ewing-Merkle Electric Co. of St. Louis, which represents the Sumter Telephone Manufacturing Company in the west, is in charge of this exhibit, and will take pleasure in renewing his acquaintance with his many old friends and customers, whom he hopes to have the pleasure of meeting during the remaining months of the fair.

STANDARD UNDERGROUND CABLE COMPANY.

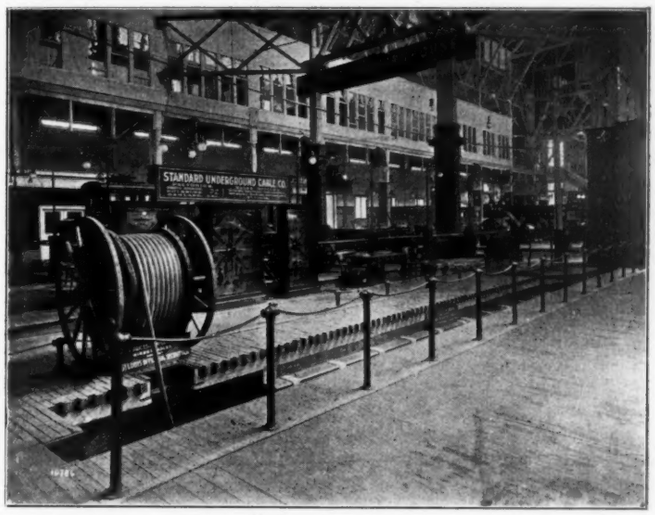
The Standard Underground Cable Company of Pittsburg, in conjunction with the McRoy Clay Works, has an exhibit which shows a section of forty-eight ducts of ap-



SECTION OF STANDARD UNDERGROUND COMPANY'S EXHIBIT.

proved subway, including manholes at either end of the subway, all the details of conduit construction being capable of careful investigation by means of a trench which extends the entire length below the surface of the floor. One manhole is closed with the ordinary form of cover and in it is placed a capstan of the manhole type, bolted to the same at the top and boarded at the bottom in the regular way, a rope fastened to it and this rope extending through the conduit and fastened to the cable at the other end exactly as is customary in the best modern practice. At the far manhole is mounted a large reel on a pair of wheels, the most convenient way of handling the reels, the cable going into the subway and being fastened to the rope.

In the manholes proper are shown joints and high tension



STANDARD UNDERGROUND CABLE COMPANY'S EXHIBIT.

cables and the method of racking the cables on Nordyke cable hangers, which makes a very complete form of construction. From the manholes cables feed to various terminal boxes, as shown on the pole at the right-hand end of the section facing the exhibit, there being a telephone terminal box and also (the black box on the side of the pole) an Acheson terminal for connecting underground cables to trolley lines. On the side of the pole is also shown a Branch splice on a telephone cable which comes from the manhole, one portion of the cable going to the box on the top of the pole, the other extending aerially across the exhibit to a pothead at the other side.

In addition to these features, several large cases show the more recent forms of underground, aerial and submarine cables manufactured by this company for the various purposes of telephone, telegraph, fire alarm and electric light, street railway, etc. There are also shown the various details of joints, junction boxes, terminal heads, and in general, everything which goes to make up a complete underground installation.

GENERAL ELECTRIC COMPANY.

It is extremely interesting to note the diversity of electrical application at the St. Louis World's Fair, as indicated by the material which the General Electric Company of Schenectady, New York, has supplied. Not only has this company supplied a complete central station equipment, of the very latest type, with a capacity of 3,000 horsepower, but it has also supplied rotary converters, transformers, motor-generator sets of different types and sizes, motors for operating an infinite variety of machines, with accompanying controlling and regulating devices, and electric lamps of every type now manufactured. This apparatus is located in every part of the grounds and in nearly every building of the exposition.

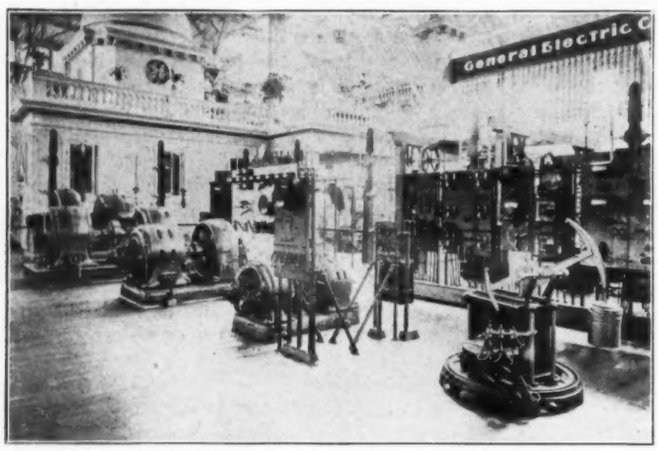
The prime movers at the exposition are located in Machinery hall, which is the only exhibit building to which

steam is supplied. It is here that all of the current for electric lighting and power used by the exposition is generated. The most interesting feature to engineers of all the different prime movers is the Curtis steam turbine exhibited by the General Electric Company. This is of 3,000 horsepower capacity, direct connected to a three-phase, 6,600-volt, 25-cycle generator. This unit is of unusual interest, because it is the first of the steam turbines to be built with the condenser in the base of the machine.

The remarkable compactness of this outfit is especially emphasized by comparison with the vertical reciprocating sets in the exposition power plant immediately adjoining. It is interesting to note the small floor space occupied by the Curtis turbo-generator outfit, including all of its auxiliaries. The installation includes complete equipment for running condensing or non-condensing, with turbo-exciter and the regular oil break switches and switchboards required by the modern central station.

Two of the four generators in the exposition company's power plant were furnished by the General Electric Company. These were the first machines to furnish power in the exposition service plant and have been in continuous service since April 15. The General Electric Company furnished the entire electrical equipment for the intramural railroad. The incandescent lamps used by the exposition were all bought from the General Electric Company, and represent the largest incandescent lamp order ever placed. The total number of lamps bought exceeds 500,000. Of these over 80,000 are colored lamps for use about the Cascades. All of the lamps supplied on this order are of the Edison Exposition type.

For lighting the outlying parts of the grounds, the interior of the buildings and the famous Pike, the General Electric Company's series alternating street system is used entirely. All of the searchlights used by the Exposition were also bought from the General Electric Company. General Electric transformers of the oil cooled and water and oil cooled type are used in all of the sub-stations of the different exhibit buildings, including Festival Hall, Fine Arts and the Cascades. The entire power house used for lighting the Administration building is also equipped with apparatus furnished by this company. Along the Pike many of the features use this company's motors and transformers. Altogether the General Electric Company is furnishing for use at the Exposition over 11,000 horsepower in generating apparatus and more than 41,000 horsepower of all other apparatus.

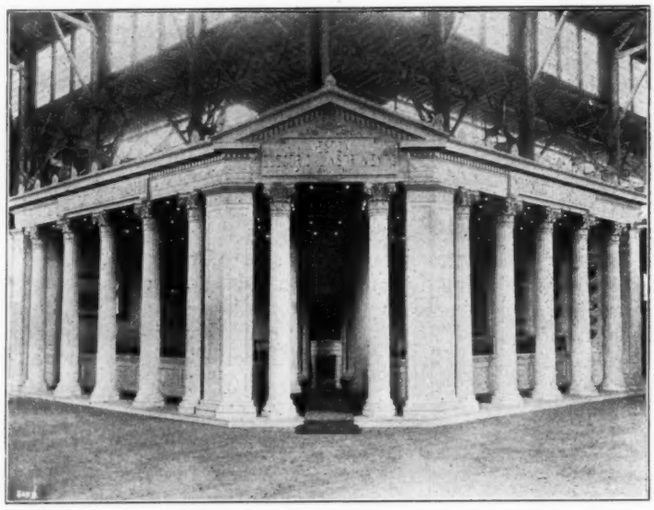


GENERAL ELECTRIC COMPANY'S EXHIBIT.

The General Electric Company's exhibit in the Electricity building has the largest space occupied by any individual company and presents a most dignified and attractive appearance. The warehouse type of exhibit has been entirely abandoned by this company, and here we find practically everything in operation.

WESTON ELECTRICAL COMPANY.

The Weston Electrical Instrument Company of New York has a booth which was designed by a leading New York architect, constructed under his directions, and shipped to St. Louis. For its size it is the most expensive booth in the Electricity building. It affects the Grecian style of architecture, and is finished in ivory white. The apparatus which



WESTON ELECTRICAL INSTRUMENT COMPANY'S BOOTH.

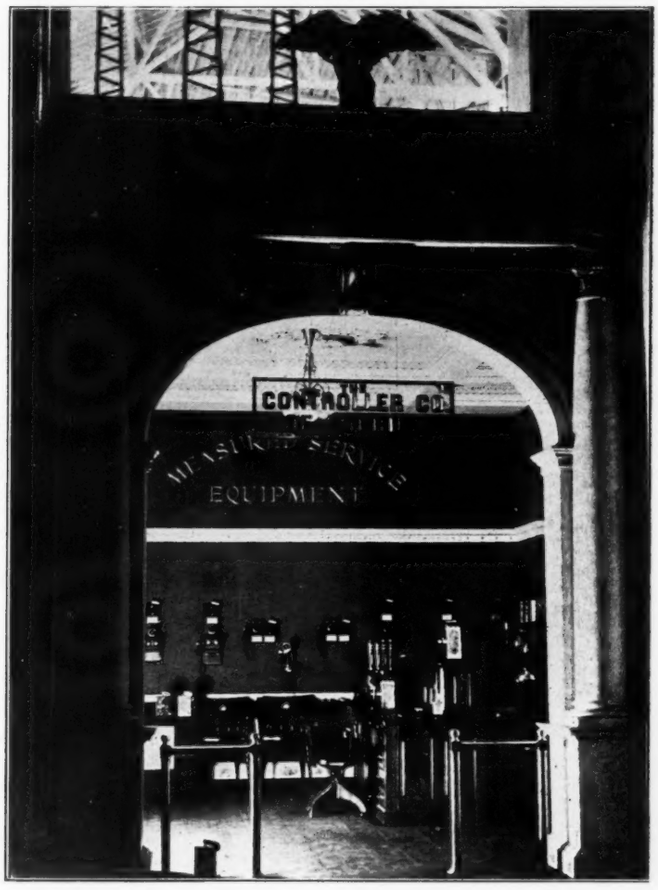
is displayed consists of station and portable voltmeters, ammeters and wattmeters. Instruments of this type for both alternating and direct current are shown. In addition, this company has placed on exhibition for the first time a variety of new types, such as bridges, rheostats, potentiometers and galvanometers. Part of the display comprises an interesting outfit for laboratory use, and for testing and standardizing current and potential testing apparatus in general Weston instruments are necessarily not found only in the Weston booth. Their use is so universal that Weston ammeters and voltmeters form a not unimportant part of nearly every exhibit. The Weston booth is in charge of their representative, Charles P. Frey.

CONTROLLER COMPANY OF AMERICA.

The Controller Company of America, Chicago, is well represented at the fair, having a handsome booth shown in the accompanying illustrations, and in addition it has a measured service telephone system in operation, supplying local service in the Palace of Electricity, in which building its exhibit is located. This company also furnished the Stroud controllers to the Kinloch Telephone Company for use throughout the exposition grounds, with the result that that company has been able to furnish a superior grade of coin service to that given by the Bell company, as the use of the controllers relieves the service of a number of properties unpleasant to the users of the Bell company's service, due to the manner of collecting the tolls.

The Controller exhibit is located in Section 19 of the Palace of Electricity, and being at the intersection of two main aisles, is given two artistic frontings. The exterior photo taken of the east side shows also part of the interior, which is handsomely furnished and finely illuminated. The switchboard which supplies the local service in the Electricity building is located in this booth and is of the best type. Connected to it are lead cables, from which are taken off pairs of conductors to the various exhibits in the build-

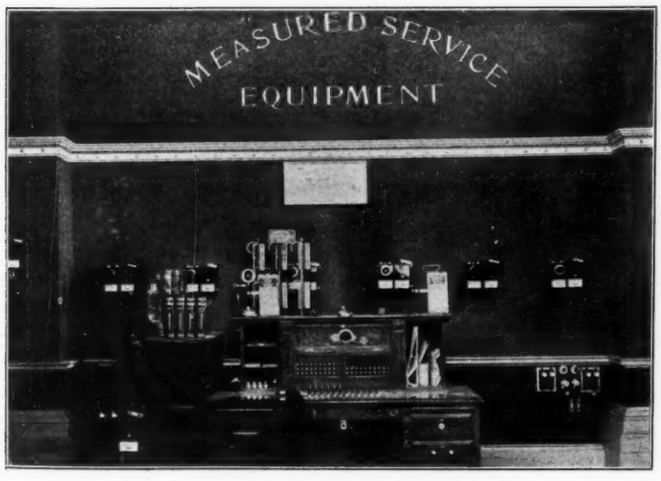
ing where the controllophones are located. There is no charge made to the exhibitors for this service. The coin is used to call the attention of the operator, but is refunded



CONTROLLER COMPANY OF AMERICA'S EXHIBIT.

on all connections, instead of only on "busy," or "can't raise calls," as is the regular practice in exchange service.

The photograph of the interior shows the controllophones



MEASURED SERVICE EMPORIUM.

in the booth; these are connected up on party lines, which run to the local switchboard.

A number of controllers are shown attached to various standard makes of telephones of wall and desk types.

A feature of this exhibit that has attracted considerable attention is the automatic controller, which is attached to one of the Automatic Electric Company's telephones. This being the first device in the nature of a pay station for automatic telephones, it has been very interesting, especially to the telephone men who are interested in automatic exchanges.

With this controller the user of the telephone may select the desired number and make the call, but upon hearing the party answer, must deposit the nickel or penny (according to the regular charge for exchange service) before the machine will permit him to talk. If he is rung up from some other station the controller is cut out automatically so as not to interfere with incoming service, but is cut in again on an attempt to make an outgoing call.

This new achievement of the Controller company is but another step by it in the direction of keeping apace with the needs, and anticipating the requirements of the telephone companies with reference to service measuring and toll-collecting devices.

Visitors at the Controller company's booth are receiving a handsome little booklet entitled, "Deadheads vs. Dividends," which will be sent to anyone upon request by letter or postal addressed to the Controller Company of America, 1061 Monadnock Block, Chicago.

NATIONAL CARBON COMPANY.

The National Carbon Company of Cleveland has an exhibit which covers a complete line of wet and dry batteries of the open and enclosed type, and represents sixty-nine different styles of batteries used for one purpose and an-

NATIONAL CARBON COMPANY'S EXHIBIT.

other; also a very complete line of highly energized discs and granular carbon used in connection with telephones operated from central energy. This part of the exhibit is quite interesting and is causing much favorable comment. In this line of goods the National company has developed something that is said to be far ahead of anything ever produced in the line of carbon discs. In the background of the exhibit will be seen the largest dry battery ever constructed, having a current capacity of over 1,000 amperes. This is not a storage battery, but a primary battery made along the same lines of the ordinary dry battery. The company also shows a complete line of the various styles of lighting arrester carbons used in connection with telephone and other circuits, also various styles of battery plates, resistance blocks, arc light carbons, carbon brushes, electrodes for electro-metallurgical work, carbons for focusing lamps, stereopticon use and X-ray apparatus.

CROCKER-WHEELER COMPANY.

Among the many large and impressive power units in Machinery hall at the Exposition the generating plant of the intramural railway is distinctive and unique. It contains the only railway machines on the grounds, and the plant is divided into a number of units, exhibiting a variety of types of engines.

A characteristic feature of the present exposition is the placing of the entire power plant in a prominent location in one of the main exhibit buildings where it can be readily seen by all visitors. This has not only brought the plant nearer to those whom it particularly interests, but has also rendered Machinery hall notable for its working exhibits, for machines in operation always have increased attractiveness.

The railway power plant is in a central location opposite the main north entrance to the building and occupies a space of about 10,000 square feet. The entire electric generating equipment is furnished by the Crocker-Wheeler Company of Ampere, New Jersey, and consists of seven operating units with a combined capacity of 3,500 K. W. The largest generator has an output of 900 K.W. and is driven by a Buckeye 26½" and 50"x48" horizontal cross-compound steam engine, running at 100 r.p.m. A second unit of 600 K.W. capacity runs at 85 r.p.m., and is connected to a Lane & Bodley horizontal cross-compound 20" and 40"x54" engine. There are three units of 500 K.W. capacity each. In one of these the engine runs at a speed of 100 r.p.m., and is driven by a 26"x48" simple rolling mill type of Corliss engine, manufactured by the Murray Iron Works. The other two engines are driven by Brown-Corliss 18" and 36"x36" vertical cross-compound engines at a speed of 135 r.p.m. The sixth unit is of 400 K.W. capacity and uses a Harrisburg horizontal tandem compound 15" and 40½"x26" engine, running at a speed of 150 r.p.m. It will be noticed that the six steam-driven units comprise a number of types of engines; two of horizontal cross-compound form, two vertical cross-compounds, one horizontal tandem compound, and one a large simple engine.

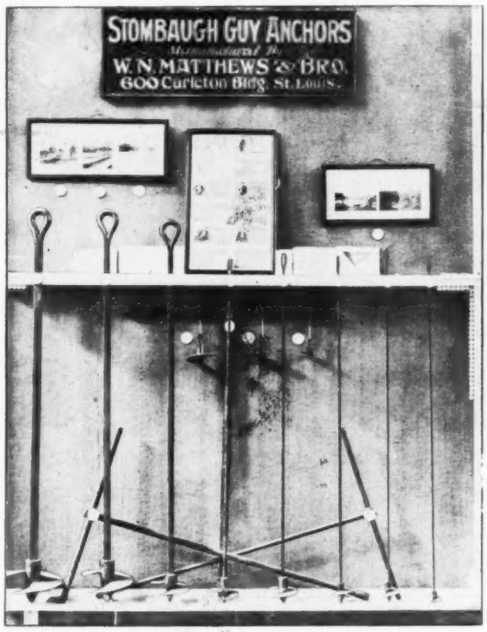
The last generating unit in the series is of an entirely different type, consisting of a 100 K.W. generator, driven at a speed of 700 r.p.m. by a water-wheel operating under a pressure of 300 pounds per square inch at the nozzle. The water power is supplied by a pump with a capacity of 1,200 gallons of water per minute. With the exception of differences in size and in detail of proportion, the several generators are similar. The machines are compact, and great care is given to the design of the electrical and magnetic circuits. All parts are constructed with a view toward simplicity and effectiveness in performing the functions for which they are designed, and through the care given to details, as well as important features, the generators have established among customers a reputation for steadiness of operation under continuous heavy loads or rapid load fluctuations.

These standard railway generators, driven by various forms of prime movers using both steam and water power, together with an extensive switchboard equipment, unite in making a most complete operating exhibit of a modern railway generating station.

W. N. MATTHEWS & BROTHER.

The Stombaugh Guy Anchor is very interestingly displayed in an exhibit in section 8 of the Electricity building. To those who are interested in guying, this exhibit should prove exceedingly interesting. All sizes of the Stombaugh Guy Anchor are shown, from the strong little 3½-inch to the heavy and invincible twelve-inch anchors. Photographs showing the various conditions under which the Stombaugh Guy Anchor is used are shown. One shows a pole of the St. Louis Transit Company, which is anchored by an eight-inch Stombaugh bored under a granitoid walk, saving digging, destruction of walk and filling and repair work.

The Stombaugh Guy Anchor is used all over the World's Fair grounds. Eight, ten and twelve inch Stombaughs are holding strains on the enormous mast of the DeForest Wireless Telegraph Company. Ten and twelve-inch anchors are holding wind strains on the aereodrome. The poles on the



STOMBAUGH GUY ANCHOR EXHIBIT.

Intramural railway are being held by six-inch Stombaughs. An eight-inch anchor is holding the strains in the pulling tests being conducted in the court of the Electricity building by the American Street Railway Association.

W. N. Matthews & Brother, 600 Carleton Building, St. Louis, will gladly answer any questions in regard to the Stombaugh Guy Anchor, and will be glad to receive calls from their friends and customers who may visit the great exposition.

AMERICAN ELECTRICAL HEATER COMPANY.

The American Electrical Heater Company of Detroit has an exhibit, covering approximately an area of 1,000 square feet. It is located in the southwest corner, section 20, of the Electricity building, and contains everything in the electric heating line that is at present in use. It includes a full line of electric curling iron heaters, electric warming pads, coffee and tea pots, water boilers, chafing dishes, coffee and water urns, and stew pans, seventy-five different shapes and weights of laundry irons and tailors' irons, from the little twelve-ounce iron, used by the traveling public to carry in a grip or satchel, for ironing out small articles of wear which become mussed during their travels, to the thirty-pound iron used by manufacturers, also twenty-five different sizes of soldering irons, and everything needed in the cooking line, such as hot plates, griddle cake cookers, broilers, ovens, plate and food warmers, and various special appliances used in a kitchen. Besides the above mentioned are found glue pots, solder pots, annealers, treeing irons, branding stamps, sealing wax heaters, air heaters, foot warmers and various special applications of electric heating as applied to industrial work, in great variety.

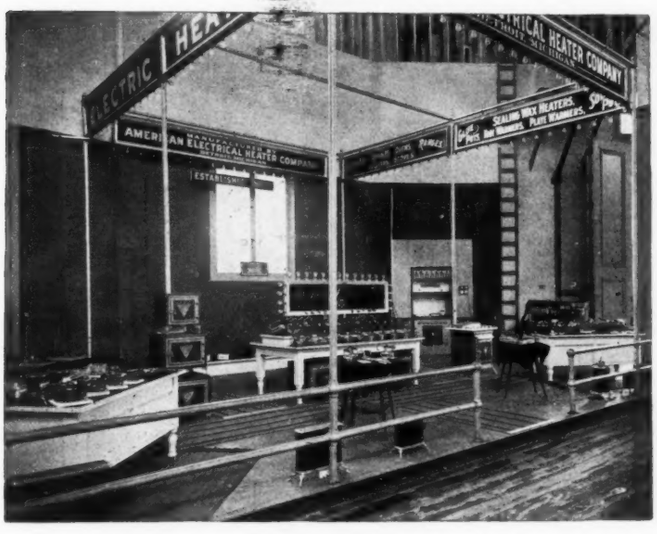
One of the novel features of the exhibit, and one that has at all times an interested audience, is the practical demonstration of the electric iron for domestic use. This shows the iron in actual use on the various articles ordinarily used

in a household, and proves beyond the shadow of a doubt the wonderful advantages the electric irons possess over the old style iron heated in the ordinary manner by a gas, coal or wood stove.

Of special interest to the telephone industry is the small soldering iron designed especially for use at switchboards and other small work. The iron complete weighs but ten ounces, is ten inches long over all, has a removable copper tip five-sixteenths of an inch in diameter, which can be forged or filed to any desired shape. The current consumed is but 90 watts and with a cord and attachment plug can be connected to any ordinary lamp socket with perfect safety, doing away with all danger from the troublesome gasoline torch or charcoal furnace and insuring at all times an iron of uniform heat. The time and labor saved are readily perceived when consideration is taken of the annoyance caused by the old style iron by being obliged to continually stop to clean and retin the ordinary tool on account of the excessive heat from the furnace having destroyed the previous tinning.

Another striking feature shown is a complete electric cooking range, for domestic use, differing widely from anything ever before shown in this line. The outfit consists of an oven, broiler, griddle and three disk heaters of varying sizes. The oven is arranged below with a row of six switches of special design, above it. The switches are also arranged with pilot lamps located behind small glass panes bearing the names of the different devices and indicating whether the device is on or off. Over the oven and switch arrangement is a mounted slab on which the remaining devices are placed. All the heaters can be removed by simply lifting them off, electrical connection being made by the aid of contacts, fastened to the bottoms of the heaters, and extending downward through holes in the marble, into special spring clips underneath. This method allows of the heaters being easily removed and cleaned and insures at all times an outfit of compactness, cleanliness and neatness not obtainable in any other way.

Not only has electric heating been successfully applied to all articles of domestic use, but also to a large variety of industrial apparatus where safety, lower rates of insurance,

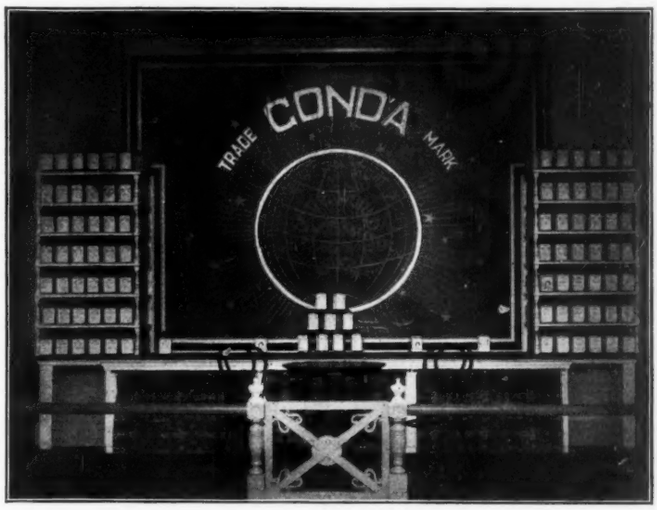


AMERICAN ELECTRICAL HEATER COMPANY'S EXHIBIT.

the saving of time and labor and cleanliness are of first consideration. The demand for electric heating devices of all kinds is rapidly growing, which is very evident from the fact that not only is this class of goods sold in large quantities in the United States, but in foreign countries as well, some of the American company's recent shipments having contained consignments to Mexico, Canada, the Philippines, England, and various other foreign countries, not even excepting South Africa and the Transvaal.

LECLANCHE BATTERY COMPANY.

The Leclanche Battery Company of New York city, only manufacturers of the celebrated "Gonda Trade Mark" batteries, have an exhibit which has attracted no little atten-



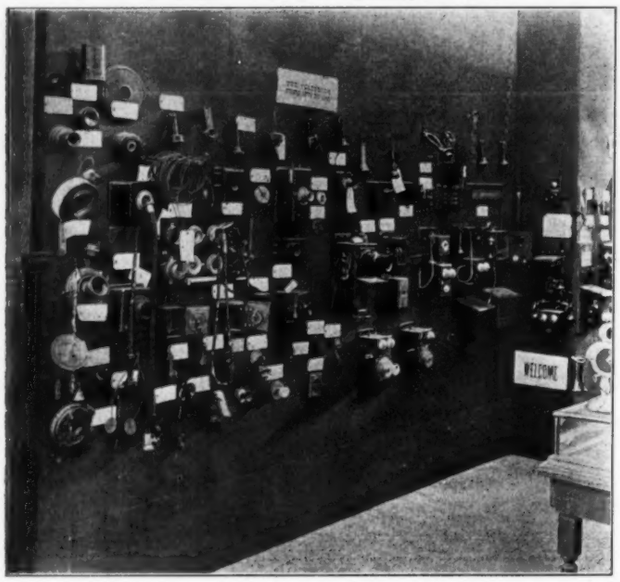
LECLANCHE BATTERY COMPANY'S EXHIBIT.

tion, and has been the means of giving this company still wider publicity among the users of batteries in particular and visitors to the fair in general. While the batteries made by this concern are known under the general title of "Gonda Trade Mark" batteries, they are designated by the distinctive names of "Gonda Porous Cup," "Axo," "Gonda" and "Wedge," all of which are to be seen in the exhibit. The Leclanche company had an exhibit of its batteries at the Columbian Exposition in Chicago in 1893 which was very neat and attractive, but its display at St. Louis is even superior to the one made at Chicago. Any person passing this exhibit is sure to give it more than ordinary notice. Souvenirs in the shape of a little booklet setting forth the merits of the "Gonda Trade Mark" batteries are given away by the thousand. As the booklet also contains tables of weights and measures of both the metric and old systems, electrical units, relative resistance of metals, etc., it is eagerly sought for by the multitudes of souvenir collecting sightseers.

EVOLUTION OF THE INDEPENDENT TELEPHONE.

Time and space will not admit of giving full description of one of the most useful inventions the world has ever known. Suffice it to say that there have been many different machines made to carry audible sounds, many of which are extinct. In the exhibit made by B. F. Wasson of Clinton, Illinois, in the Electricity building, as many of the early makes as could be obtained are shown. William Hubbard of Elgin, Illinois, furnished a large part of this collection. A number of other Independent telephone men furnished a lot of interesting curios. The lovers' telephone, furnished by Day Phares of Clinton, Illinois, was the first manufactured telephone, consisting of a small wooden tube with one end covered with gold beater skin, the conductor being a small string used by druggists as wrapping twine. A conversation can be carried on over this instrument several hundred feet. At the left of the accompanying picture will be seen the principal styles of the acoustic telephone, including the acoustic switchboard, used in Elgin, Illinois. After this came the magneto, where magnets are used conveying current from one party to another, without the aid of bat-

teries. Then came the arm rest telephone, where it was necessary to put your arm on a switch and hold it there while talking, so as to keep your battery in the circuit. There are a number of switchboards of the early time that are not shown in this picture, also the evolution of the insulator, furnished by the Munsey Glass Company, with the protectors furnished by F. B. Cook of Chicago; the latest type of switchboards and telephones, furnished by the American Telephone Company and the Automatic Telephone Company of Chicago. The Adjustaphone, furnished by the Wesco Company of St. Louis, and the modern cable potheads and sleeves by the Novelty Company of New Haven, Connecticut. To appreciate this collection one would have to go through it and read the history of the different parts and telephones that have taken so long, not only to invent, but to collect and arrange. Mr. Wasson has taken this entire expense upon himself to show something of the pains



THE TELEPHONE FROM 1876 TO 1895.

and expense that inventors have been to, in order to reach the development of the modern telephone.

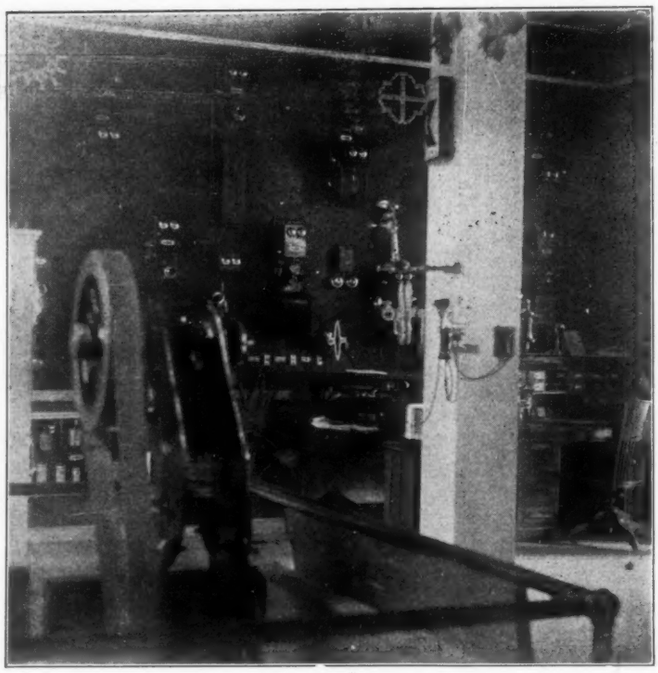
CENTRAL TELEPHONE AND ELECTRIC COMPANY.

The Central Telephone and Electric Company of St. Louis has an exhibit that for prominence of location, beautiful appearance and interesting features cannot be excelled. Its booth is attractive and artistic. The entire facade is decorated in white with gold trimmings, the company's name appearing in gold letters in the center. On each side appears the well-known "Arrow" trade-mark in red, white and blue. The interior of the booth is decorated in red burlap to the chair rail and above this the walls and ceiling are covered with a light green burlap, small silk flags of every nation being used for further decoration of the side walls. All wood work of the interior of the booth is white. On the side walls are shown all styles of telephone apparatus of this company's manufacture in various woods and finishes, there being five different finishes for each style of telephone—central energy, with and without local talking battery, bridging and series magneto telephones in six different forms, and various designs of desk telephone apparatus.

There are also shown the Central "Giant" extension bells, extension bells with condensers, and regular types of extension bells. On the pillars and pedestals of the booth are shown the various types of central protectors, in which their well-known patent wrapped fuse is used, single and double line fuse blocks, distributing boards, cross connecting boards, plain and with test clips, self soldering heat coils, etc. Also a full line of the celebrated Becker terminal heads.

CENTRAL TELEPHONE AND ELECTRIC COMPANY'S BOOTH.

The Central Telephone and Electric Company is justly proud of its success in the protector line and is making this



SECTION OF CENTRAL TELEPHONE AND ELECTRIC COMPANY'S EXHIBIT.

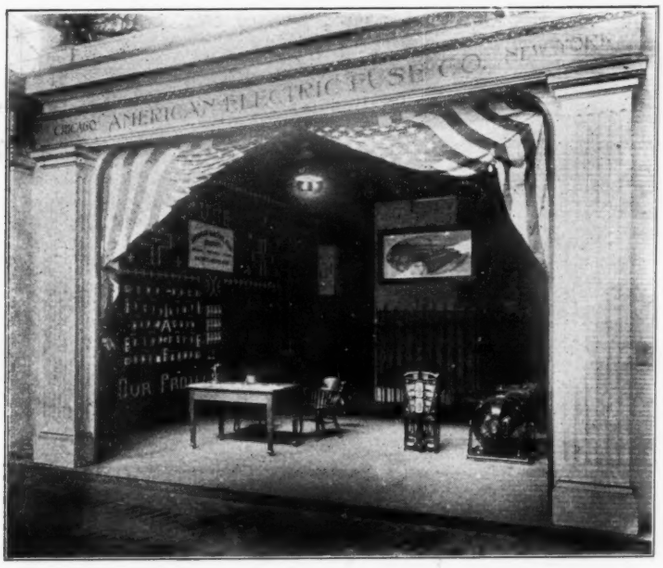
department a prominent feature of its exhibit. In the center of the booth a powerful punch press has been installed,

driven by an electric motor, on which will be shown the manner of making parts for the protector line, and on a bench in front part of booth will be workmen assembling these parts on porcelain base fuse blocks, which will be given to customers as souvenirs. The company is also well provided with other souvenirs in the form of miniature watch charm receivers, button pins with its "Arrow" trademark on same, and their handsome instrument catalogue, in which are shown various views of the Exposition exhibit buildings, the Cascades and World's Fair sculpture.

The Central Telephone and Electric Company extends a hearty invitation to all telephone men to visit them and make this booth their headquarters while at the fair, but to those who will be prevented from doing so they will gladly mail free of charge, on request, the souvenirs mentioned above.

AMERICAN ELECTRIC FUSE COMPANY.

The American Electric Fuse Company of Chicago has a very fine exhibit of the well-known "American" specialties. A thousand-pair protector and distributing frame equipped with self-soldering protectors is the main feature of the



AMERICAN FUSE COMPANY'S EXHIBIT.

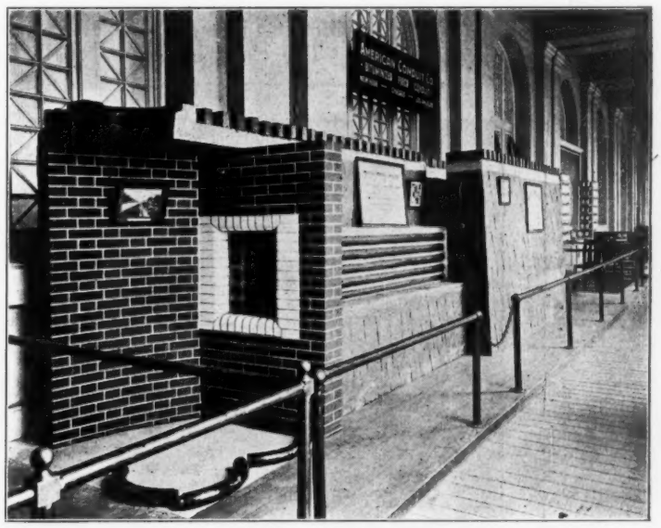
exhibit. The walls of the booth are covered with handsome panels showing the full line of fuses, fuse blocks and lightning arresters. The American Electric Fuse Company's exhibit is the only complete World's Fair exhibit of protector apparatus, and is one of the most attractive and interesting exhibits in the Electricity building.

AMERICAN CONDUIT COMPANY.

The American Conduit Company has an attractive and interesting exhibit in the court of the Palace of Electricity at the World's Fair. This exhibit is worthy of the attention of anyone interested in underground electrical construction. The exhibit demonstrates the high class of underground construction obtained by the use of their bituminized fiber conduit. It consists of a portion of a manhole showing the neatness of construction possible with this conduit at the entrance of the manhole. Also a portion of the underground system with the street, the earth and the concrete filling removed to expose the ducts themselves. This portion brings out one of the advantages of the long lengths, namely, the few joints in the system and also shows the perfect and permanent alignment secured and the sealed joints, a feature invented and introduced by this company.

Another portion of the exhibit shows the open trench with the various layers of ducts as they appear in the course of actual progress of the construction work.

There are in addition to the above some bends of various radii and diameter and some lengths of conduit. Also some interesting photographs showing construction work in various cities where bituminized fiber conduit has been used. An attractively furnished office or reception room is provided for the convenience and comfort of those who are directly or indirectly interested in electrical conduits and visitors will secure the courteous attention of C. M. Ripley, electrical engineer, in charge of the exhibit, who seems



AMERICAN CONDUIT COMPANY'S EXHIBIT.

always delighted to give information relative to bituminized fiber conduit.

The company hopes to give some interesting demonstrations in the way of tests showing the high insulating qualities of this conduit.

LOCKE INSULATOR MANUFACTURING COMPANY.

The Locke Insulator Manufacturing Company of Victor, New York, has a fine display of its celebrated high-tension insulators in the exhibit of the Wesco Supply Company in the Electricity building. These insulators are of various sizes, from the smallest telephone insulator to an insulator fifteen inches in height and seventeen inches in diameter. The latter mammoth insulator is designed for working voltages of 80,000 volts, and will stand a break-down test, of course, much in excess of this. It consists of an umbrella-shaped porcelain top surmounting three porcelain petticoats, which prevent discharges to the pin. This display of insulators is attractively arranged and has elicited much favorable comment from the thousands that have viewed it.

ELECTRIC STORAGE BATTERY COMPANY.

The Electric Storage Battery Company of Philadelphia has the most extensive and comprehensive exhibit that has ever been made of storage batteries and auxiliaries. It is located in Block 20, Electricity building. A conspicuous feature is a map about thirty feet in height by forty-five feet in length, which, by an ingenious arrangement, shows the distribution of chloride accumulator installations throughout the United States. Illuminated glass jewels designate the locations and characters of the installations, whether for railway, central station, isolated lighting and power service, yacht plants or telephone installations.

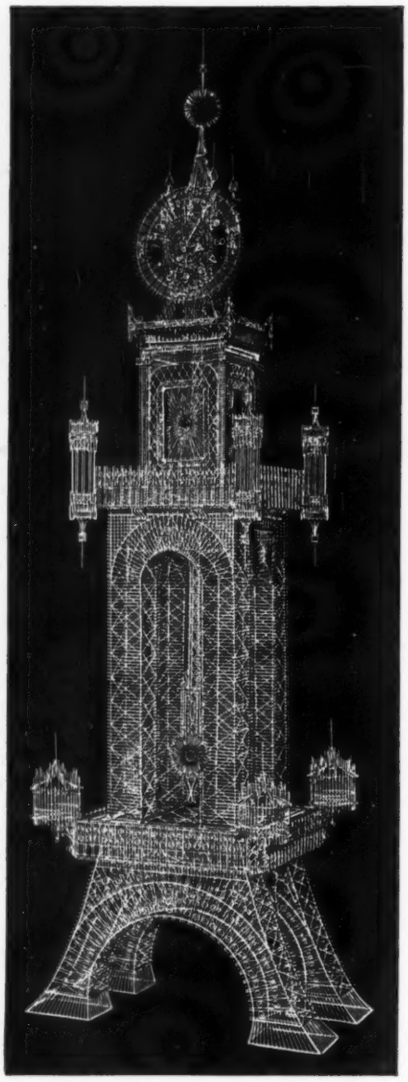
In another section of the exhibit there are five types of

switchboards, together with end-cell switches, storage battery recording instruments, etc.

There is set up in a model battery house a complete operating installation of chloride accumulators for railway service. Specimens of chloride accumulators, ranging in size from a sixty-one horsepower type of cell to the smallest laboratory cells, are also shown, together with a complete exhibit of the Exide battery used for electric automobile work.

KESTER ELECTRIC MANUFACTURING COMPANY.

The accompanying illustration shows a unique clock, the unusual feature about it being that it is constructed entirely of pins, soldered together. The clock is to be seen in the



ELECTRIC CLOCK MADE OF PINS.

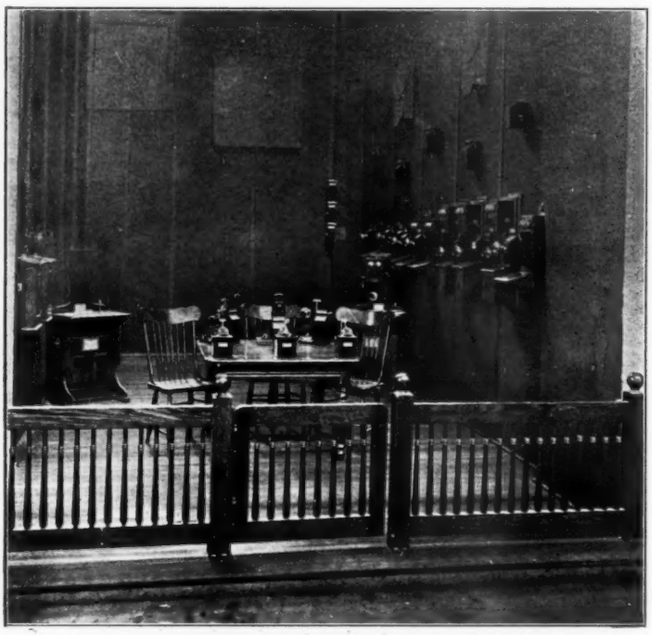
exhibit of the Kester Electric Manufacturing Company of Chicago.

The clock is driven by electricity, eight or ten dry cells furnishing the necessary current. The pendulum is arranged so that its movement in one direction is obtained through the agency of a weight, the weight being lifted on the return stroke by an electromagnet brought automatically into circuit with the batteries at the proper time by the movement of the pendulum. Thus the energy of the battery is utilized to lift the weight, the potential energy of which is then ready to actuate the pendulum.

The clock requires no winding. There is no other material used in its construction other than pins of various sizes and Kester self-fluxing solder. This interesting novelty was designed by F. G. Dickerson of Chicago, manager of the company, the device being built to show the possibilities of the solder. Not quite a year was required for its construction, the work being done entirely by hand. The weight of the clock is 40½ pounds. The Kester exhibit, where the clock may be seen, is in the northeast corner of the Electricity building.

BAIRD MANUFACTURING COMPANY.

The exhibit of the Baird Manufacturing Company of Chicago is located in the southeast corner of the Electricity building. They show a complete line of their telephone pay stations, telephone time stamps, peg counters, call registers, etc., for the use of telephone companies. The Baird company's booth is one of the neatest in the telephone section, the exhibit is tastefully arranged, and as a result there is never an hour of the day when there is not a crowd inspecting the display. Representatives of the company are on



BAIRD MANUFACTURING COMPANY'S EXHIBIT.

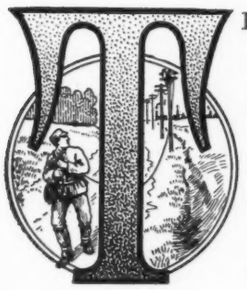
hand at all times to explain the workings of the different apparatus and to extend the glad hand of welcome to all visitors. The company offers to submit samples of its machines to telephone companies for inspection and trial at any time and will be pleased to have visitors to the exposition call at their exhibit and examine their line of apparatus.

The United States Circuit Court of Appeals has decided that Spanish war taxes to the amount of $21,492, paid upon messages by the New York Telephone Company, are not to be refunded. The company sued on the ground that the fees for messages, at 15 cents each, were based on the cost of maintaining wires and other expenses. It was held that the government, in taxing messages, should not have levied its tax upon the full amount which the company collected from subscribers. The court ruled that the company, by altering the phraseology of its contracts, might have escaped the tax, but had not done so and was clearly liable.

Subway Construction

D. R. CRAIG

PART II.



THE selection of material for subway work is a most important feature of the job. In the first place, a good conduit should be chosen. There are several forms of conduit used for telephone work, including vitrified clay (both single and multiple duct), fiber, creosoted wood, cement-lined iron pipe, and a single duct conduit made of Portland cement and fine crushed rock formed and set under a heavy pressure and known as stone conduit. In rare cases iron pipe is used, but its expense, its liability to rust and its susceptibility to the effects of electrolysis makes it very undesirable. Each of the conduits mentioned claims some advantages not possessed by the others, and all have been made use of enough to test their practicability.

It is not the purpose of the writer to recommend any particular form of conduit. A close inspection of the different makes will disclose their advantages and enable one to come to a decision in the matter. However, a description of the different kinds that are in most general use will not be out of place.

The vitrified clay conduit is probably used to a greater extent than any other form. It has high insulating properties and offers a perfect resistance to the action of chemical elements. Unless destroyed by mechanical means its permanency will endure indefinitely. It is manufactured in

FIG. 1—SINGLE DUCT CONDUIT.

two forms, the single duct (see Fig. 1) and the multiple duct. The standard form of the single duct is in sections or units eighteen inches in length, its internal diameter being three and one-quarter inches. It is perfectly round on the inside, but the outside is square, with corners chamfered off, and measures four and five-eighths inches in dimension. Slight corrugations lengthwise of the piece are made on the outside to allow the concrete or mortar to adhere more closely. Among the advantages of this conduit are the care with which it is handled and, on account of its short length, the possibility of going over or under obstructions met with in the trench, the short length permitting a deflection so gradual that it does not affect the drawing in of cables, thus avoiding extra manholes. For this reason it might be called "flexible," the term referring to the possibility of making the slight changes necessary to pass obstructions, rather than to any possibility of actually bending the conduits themselves. Another favorable feature of this duct is in the matter of repairs. In the event of damage to any part of the conduit, the injury is easily remedied by removing the damaged piece and installing split spieces, which are furnished, thus making the duct as good as when first laid. This can be done without the removal of cable that may be occupying the duct, and is an obvious advantage. This conduit is made by the H. B. Camp Company.

With all single-duct conduits any desired arrangement of ducts is possible.

Multiple duct conduit (see Fig. 2) is made of but one material, vitrified clay. It is made under the same processes and in the same manner as the single duct clay product. In order to meet all requirements it is made in quite a number of sizes—two, three, four and six duct, especially the latter two being most universally used. The four and six duct variety are usually three feet long, the smaller sizes being made two feet long. The inside diameter is three and one-quarter inches and the bore made more nearly square than in any other form of conduit, it being claimed that cables can be more easily drawn in it, because there is

FIG. 2—MULTIPLE DUCT CONDUIT.

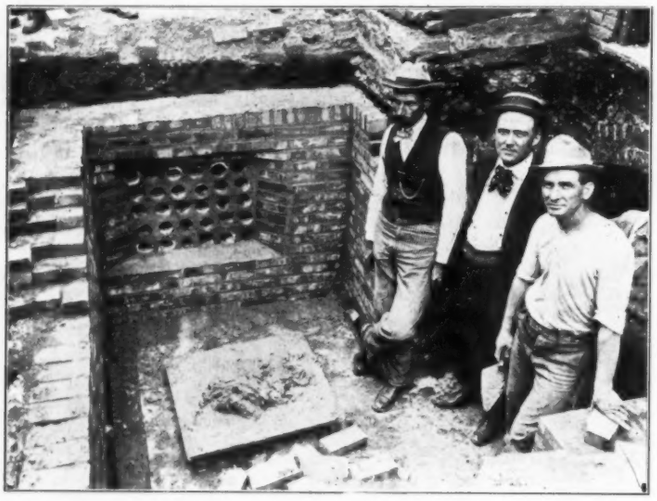
less contact and friction than in the round bore. The conduit walls are five-eighths of an inch thick and the openings at each end of a piece are slightly beveled. In order to bring the ends correctly together in laying and secure perfect alignment, a dowel hole is provided in the center of the partition walls into which an iron pin is fitted when laying. This conduit makes a most compact system, for the ducts being clustered a maximum area is secured in a minimum space. The multiple duct conduit is manufactured by the McRoy Clay Works, Brazil, Indiana, and also by the H. B. Camp Company.

Bituminized fiber conduit (see Fig. 3), made by the American Conduit Company, is another form which has been on the market for some time, and its use is constantly increasing. Among the points of superiority claimed for it are that it is electrolysis-proof, non-abrasive, moisture-proof, non-corrosive, light and strong, and the rapidity and cheap-

[Note.—The next in this series of articles by Mr. Craig will treat of laying the conduit, refilling and repaving, man-holes, distribution, etc.]

ness with which it is laid. It is made in seven-foot lengths, and can be procured in any diameter, though three, three and one-quarter and three and one-half inches are the standard sizes. The fiber is thoroughly saturated and coated with a bituminous compound, enabling it to withstand all destructive influences. The method of joining unit to unit is by means of male and female joints, which are slipped together, insuring a permanently fixed alignment without the use of mandrels. This method gives the ideal joint. Owing to the lightness of this conduit and its non-brittle nature it is convenient for shipping and handling, and as the method of laying is simple it can be done by unskilled labor.

There is another make of fiber conduit, manufactured by



ENTRANCE OF DUCT INTO MANHOLE.

the Fiber Conduit Company, which has been in use for over ten years and has given quite general satisfaction. On account of the properties of this material it reduces to a minimum the risk of injury to cable from chemical or electrolytic action and acts as a neutral lining to the holes through the mass of concrete which has been moulded about it. It is made either with screw or socket joints, in five-foot sections and at any required diameter up to four inches. The manufacturers of fiber conduit designate their product in the spelling of the word, one spelling it "fiber" and the other "fibre."

The oldest form of conduit is that made of wood, creosoted with dead oil of coal tar. (See Fig. 4). It is quite largely employed and has the advantage of being very easy to install. It is sometimes known as "pump-log" on account of the resemblance to the ordinary form of wooden pump logs. This conduit is shown in accompanying illustration. It is made in eight-foot lengths, single duct, the ends being doweled to

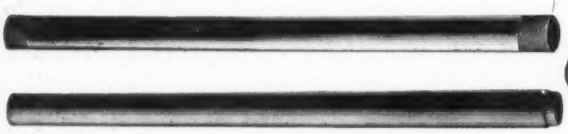


FIG. 3—BITUMINIZED FIBER CONDUIT.

preserve the proper alignment in joining. The bore is circular, usually three inches in diameter. The external cross-section is square, four and one-half inches to each side. It is cheap to lay, requiring no concrete or mortar, and having only to be driven together by an ordinary workman. An eastern telephone company has used this product for twenty years and a recent examination has shown no signs of deterioration. In Philadelphia last fall some of this conduit, which had been underground for fifteen years, was excavated to make some changes in the lines and the engineer in charge reported that not a piece showed any signs of decay. The maker of this conduit is the Wyckoff Pipe and Creosoting Company.

Stone conduit, or stone pipe (see Fig. 5), has recently come into quite a good deal of popularity for subway work. Crushed limestone and the best quality of Portland cement are used in its production by the American Stone Conduit Company. It is made in single duct, six-foot lengths, four and one-half inches outside diameter, with a three and

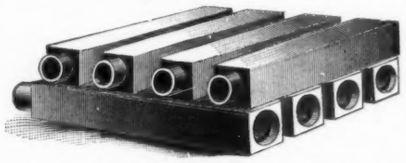


FIG. 4—CREOSOTED WOOD CONDUIT.

eighth inch bore. In the process of manufacture the conduit is subjected to an interior pressure of 3,500 pounds to the square inch giving great strength to the walls and a highly polished inner surface. Displacement taking place from the interior gives an unusual smoothness. The nature of its ingredients causes it to thoroughly knit with the concrete in which it is laid, making practically a solid structure from manhole to manhole with the bores through it, and it should be everlasting. By the use of rubber mandrels that are furnished by the manufacturers, perfect alignment is assured, though a more recent method provides for an aligning collar of sheet iron tightly clamped on one end of the conduit, the next piece slipping into this collar on the principle of a male and female joint. This conduit can be easily cut in any desired lengths by the use of a cross-cut saw.

The cement lined conduit, made by the National Conduit and Cable Company, is another form of which there is a vast amount in use. It is in the form of a tube of thin wrought iron, held by rivets two inches apart. This tube is lined with a wall of cement five-eighths of an inch thick. The bore is perfectly smooth, made so by polishing while drying. The standard size of this conduit is eight feet long with a diameter of three inches. Alignment in laying is secured by means of male and female joints and these joints allow of slight bends in the line of conduit. It is claimed for this conduit that being of cement construction it improves rather than deteriorates with age, that it is an absolute non-conductor and free from any elements of expansion and contraction. The great length of the units insures strength of construction.

OTHER MATERIAL.

The conduit question disposed of there must be material for concrete and mortar, and brick, and iron covers for manholes. Good concrete may be made either with crushed stone of screened gravel, whichever is the more available. If the crushed stone is used it should be evenly broken and not too large. In localities where rock abounds it is usually an

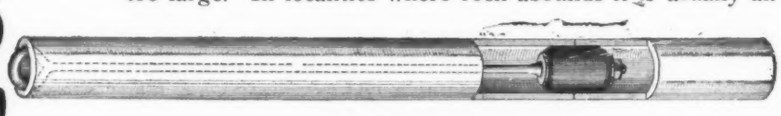


FIG. 5—STONE CONDUIT.

easy matter to have the rock one needs broken to the size required, as that work is done by machinery in a rock crusher. Screened gravel should not be very coarse in case use is made of it instead of the crushed stone. None but a clean, sharp sand should be accepted for subway work, either for the concrete or mortar. For both purposes a reliable native cement is plenty good enough. Portland cement adds materially to the cost, and while it is used by some builders, especially in the mortar for laying up manholes, fresh Louisville or Utica cement does the work in an efficient manner. In fact, one advantage of the native cement is that it does not set as quickly as the Portland, and thus if not

used immediately after mixing is still in good condition. Good concrete for subway work may be made from the following formula:

Good cement .....1 part.
Clean sand .....2 parts.
Crushed stone or screened gravel.....5 parts.

The most convenient way to buy the cement is in paper sacks, three sacks being equivalent to one barrel. The method of mixing the concrete is as follows: Turn down on the mixing board two barrels of sand and to this add three sacks (one barrel) of cement. Have the laborers turn this over well until it is thoroughly mixed, after which a sufficient quantity of water should be added to form a soft mortar. The crushed stone or gravel, in the proportion specified, should then be added and the whole mass thoroughly mixed to a uniform consistency. Another method of mixing, and a good one, is to mix the sand, cement and rock together dry, turning it over several times to get it well mixed and then adding the water, and turning it over again to complete the mixing. In neither case should the water be applied with a hose, but poured on with pails, for the pressure behind water coming from a hose projects it with such force that it washes out the cement, which is the lightest ingredient. In most cases water is secured from fire plugs or private hydrants, but it should in all cases be fed through hose into water barrels placed convenient to the mixing boards and from there put on the concrete with pails. A good way to measure the different materials is to use old cement barrels, though often wheelbarrows are made use of and growing familiarity with the work soon enables the men to become good judges of the amounts to be used.

Mortar is used for laying up the manholes, when built of brick, and is sometimes made use of in binding together the various sections of the ducts. A good mortar may be made as follows:

Good cement .....1 part.
Clean sand .....2 parts.

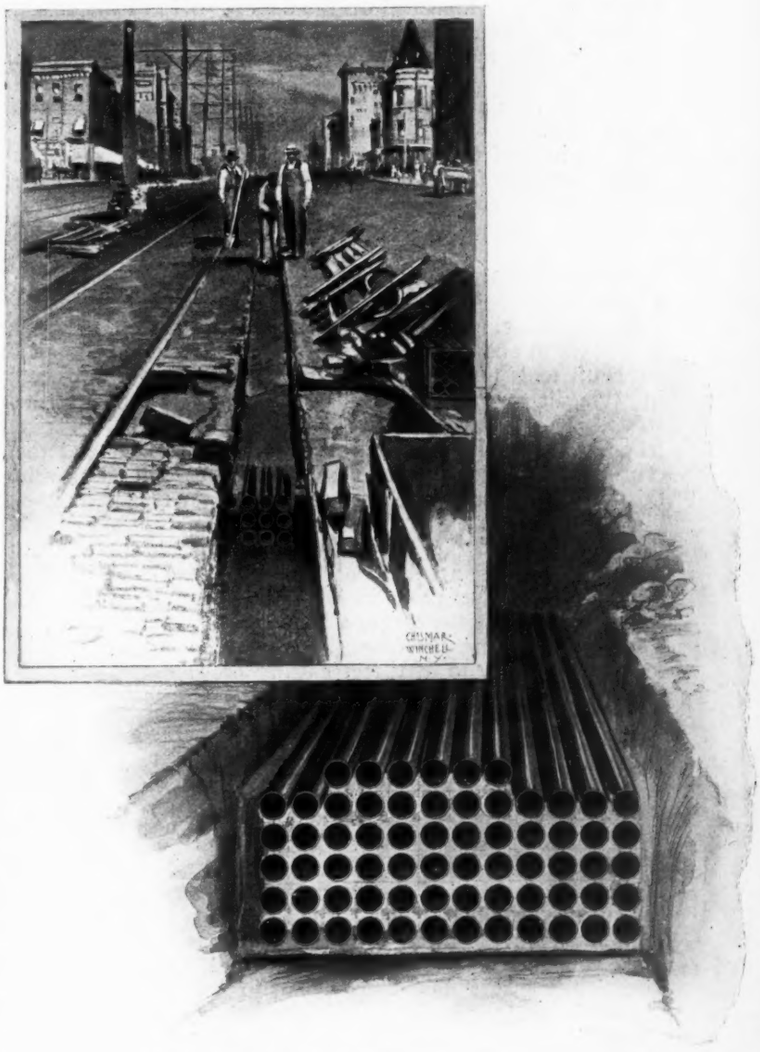
The cement and sand should be thoroughly mixed together while dry, after which water should be added to give the mixture the proper consistency for working.

Brick for the manholes should be a good quality of sewer brick. These are extra hard burned. There are several types of manhole covers to choose from, round and square, tight and ventilated.

Tools of the various kinds required should be supplied in sufficient quantity and of good quality, for a lack of them, or an outfit of tools so cheap and poor that they are most always out of order, can add to the expense of a job of subway construction with a rapidity that is surprising. Lumber in considerable quantities will be used, though none of it need be heavy or expensive, except that used for bridges. Of these there are two kinds, for teams and for pedestrians, the former used in the streets and the latter on the sidewalk crossings, and there should be at least four of each kind on every job. For the street bridges 2x12 inch pine planks, sixteen feet long, should be used. For each bridge six of these are spiked onto 4x4 inch stringers, six feet long, and placed about two feet apart, or eight of them to each bridge. Both ends of these stringers should be beveled to a point, so that both outside planks of the bridge will lie on a slant making it easy to drive on and off, especially when a little dirt is banked up on each side. A dozen men can pick up this bridge and easily place it where required. Four pieces of 2x12 inch plank, six feet long, are used for the sidewalk bridges. A four-foot stringer of 4x4 inch lumber, at each end, with another stringer in the center is sufficient. This latter stringer should be six feet long, the extra foot of projection on each side to be used for bracing the hand rail with which all these foot bridges should invariably be supplied. This rail can be made of 2x4 inch stuff and is easily put on. Such a bridge can be readily handled by four men.

There should be two mixing boards, so that while the concrete is being used off one board the gang may be mixing a batch on the other and not delay the work. The boards should be about 10x12 feet in dimensions, and made of ordinary pine flooring nailed on a 2x4 inch framework. When this becomes so rough or worn that the shovels catch in it in turning over the concrete, the fault may be remedied by laying a new floor over the old one. Some companies and contractors use a mixing board made of thin boiler iron or heavy sheet iron, the pieces riveted together, but for a telephone company doing but one or two jobs of subway work, the expense of this kind of a mixing board would be too great. The box used for mixing mortar in is of the usual kind and can be

CONDUIT IN TRENCH.



LAYING BITUMIZED FIBER CONDUIT.

put together by any man of average intelligence. A good large tool box is also an essential requirement and separate from this should be a lantern box, to prevent breakage of

red lanterns, of which there should be many, by having them in the same box with heavy tools.

In this connection it may be said that all work on the streets should be protected at night with barriers and red lanterns. It is difficult to have too many of the latter. A good investment, besides, is a reliable night watchman. He may save many times his wages in a single night by the prevention of some accident and consequent damage suit, and besides, the feeling of security in knowing that your work is well guarded and thoroughly protected, is worth not a little. Not only should the main piece of work be barriered, but all isolated or scattered piles of material should have their red lights, and the red lantern is vastly preferable to the ordinary lantern giving a white light, which is sometimes used.

PREPARATION OF THE TRENCH.

Before any piece of underground work is opened all material should have first been delivered on the ground. A measurement of the particular run, or distance between two manholes, should be taken to ascertain the number of pieces of conduit required. This should be hauled and piled along the edge of the sidewalk or curb at intervals gauged so that it can conveniently be handed into the trench without carrying any great distance. The cement, sand and stone or gravel should be unloaded on the opposite side of the street, and the brick convenient to manhole locations. Tool boxes, wheelbarrows, mortar box and concrete boards should all be handy to the work. A little foresight in this direction will save much time and rehandling of material after the work is under way.

The width of the trench necessary should be marked out in straight lines from one manhole to the next, on top of the pavement. Then the men may be set to work, at first removing the pavement between the lines marked out. In all cases except where a street is paved with asphalt the pavement should be carefully taken out, the brick, cedar blocks or granite blocks being saved and piled on the edge of the sidewalk for repaving. If the pavement is macadam it should be thrown to one side and saved. Asphalt has to be chopped out with tools made for the purpose, and there is no need in saving it for new asphalt has to be used in repaving the street. If the pavement has a concrete base, the concrete taken out should be saved for it can be screened and the crushed rock it contains be used again. A good way to do this is to throw it by itself on one side of the trench, throwing the dirt from the excavation on the opposite side. Both the concrete and dirt from the trench should be thrown well back to leave a good, clear runway on each side of the trench for working room in laying the conduit. One way to do this, after the excavation is completed, is to put men to shoveling back the dirt from the edge of the trench, and at intervals of forty to fifty feet cutting passageways through the pile of dirt to the street, so that material may be wheeled or carried to the trench more readily. A good plan is to have the concrete taken out thrown to the sidewalk side of the trench against the curb, and the dirt thrown to the street side. The latter, being the larger pile, forms a barrier to prevent driving into the trench and comes in well in case the work has to be left open over night.

In some cases, where the street is narrow or car tracks occupy a good share of the thoroughfare there is not room for such a large occupancy of the street, but existing conditions must govern in all cases and the exercise of common sense and good foresight will overcome all difficulties in this direction. Just a few words here in regard to blocking the traffic on streets. It has been the writer's experience that except in very rare and isolated cases is it necessary to shut off the traffic entirely on a street where subway work is being put in, even for a few minutes. In crossing a street intersection with your work excavate a little depth, leaving the balance of the crossing open to travel, then place a bridge over the excavation, turn the traffic over it and excavate the balance of the crossing. When you follow up with the laying of the conduit do the same, keeping one side of the street open to traffic by using bridges. The same rule applies to sidewalk crossings, where a smaller bridge may be used, but it should always have hand rails. It is but an instant's work to put men around these bridges and shift them from one side of the street to the other, as the case may be, and the fact that you have not interfered with the business of the thoroughfare is sufficient remuneration for the little extra work required. You should bear in mind that your work is subject to criticism from all the people who are on the streets, so give them as little cause for complaint as possible.

The matter of grades between manholes is one of the most important considerations in the excavation of the trench. It is obvious that an uneven bottom would not do on which to lay the conduit, which in that case would be in waves, making it impossible to fit joints snugly together and making high and low places in the work. This forms pockets for the accumulation of moisture and makes it very difficult, if not altogether impossible, to draw the cable through by reason of the great amount of friction encountered on account of the unevenness of the ducts. The matter of drainage must also be considered. For this purpose there should be a slight grade between manholes on the bottom of the trench. This grade may run in one direction from one manhole to the next or may be made by putting a summit at some point between the manholes and dropping slightly in each direction until the manhole is reached. Care should be taken not to get this summit too sharp or abrupt, for that would make the drawing in of cable very difficult over this high point by reason of the extra friction encountered, and if the crown is too sharp might preclude the possibility of it altogether.

To overcome the unevenness on the bottom of the trench, mentioned before, it must be "leveled." If an instrument is not convenient for this use, good work can be done with a straight-edge twelve or sixteen feet long, and a carpenter's level. By moving along the trench and putting the straight edge on the bottom, every twelve or sixteen feet, the level will show the high and low places, which must be taken out or filled up until the required grade is reached. One man with a shovel can do this work rapidly. Loose earth thrown in to fill low places should be scattered in thin layers, each one well tamped down with the back of the shovel to make it smooth and solid.

Both the width and depth of the trench must of course be governed by the number of ducts to be laid in it and the manner in which they are to be laid, which will be outlined in another part of this series covering the actual laying of the conduit. Sometimes in sinking the trench a pipe or other obstruction is met with that necessitates a change in the depth. If it is a small service pipe crossing the trench usually there is no need of any change, for the trench can be left at the depth originally intended and part of the conduit be laid over and part under the small pipe, imbedding it in the mortar or concrete surrounding the ducts. This is called "splitting the lead." In this case it is well to lay a short stick of wood, of the same thickness as the diameter of the pipe, on each side of the pipe so that it can be drawn out without disturbing the conduit, should it become leaky or should occasion require. Otherwise the pipe would be so firmly imbedded in the conduit that it could not possibly be withdrawn or replaced without destruction to the subway work.

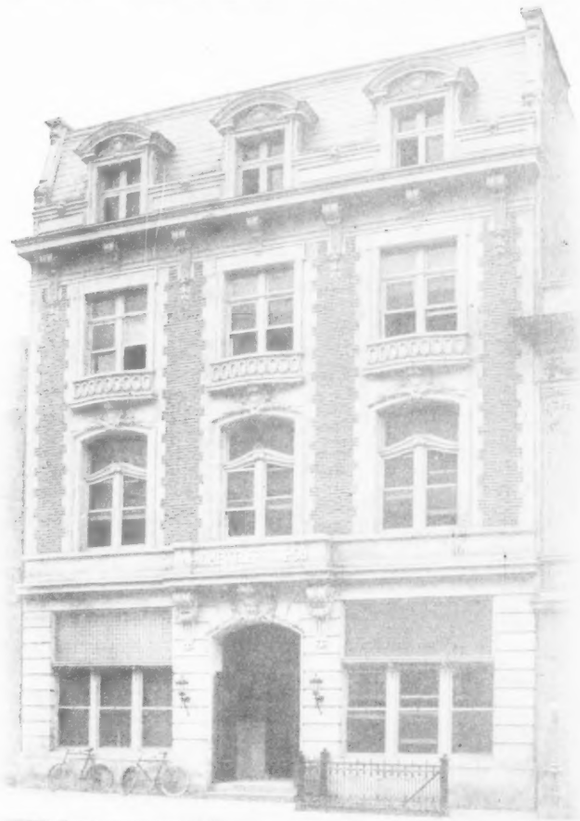
(To be continued.)

Messrs. Charles West, W. G. Harding and associates, of Wilkesbarre, Pennsylvania, have recently purchased the Citizens' Telephone Company of Honesdale. It has been reorganized under the name of the Honesdale Telephone Company, with a capital of $40,000. It now has 250 local telephones, and the new management has contracts for 100 additional telephones, which will be installed immediately.

"Let's Talk It Over"

INDEPENDENT telephony as exemplified by the Home Telephone Company of Toledo, Ohio, brings out all that is best and most desirable in the workings of an up-to-date telephone system, and furnishes an example of a successfully operated and wisely managed exchange that can be safely and profitably emulated by any telephone company in the country. The Toledo company is not only firmly established and backed by ample capital, but it has solved the problem of becoming acquainted and getting in close personal touch with its large list of subscribers and the general public, thereby bringing about a better mutual understanding and insuring to its patrons service of a high order. The primal factors in the markedly successful operation of this company are first-class apparatus and construction, to which must be added perfect operating discipline and the maximum of satisfactory service, largely brought about by the untiring efforts and able administration of C. E. Stinson, general manager of the company.

The Toledo Home Telephone Company began business three years ago and now has in operation nearly 9,000 telephones, the capacity of the exchange being 12,500. The success of the company was insured from the very first. It soon distanced all opposition by giving superior service in every way, which at once ingratiated it in the good graces of the telephone-using public, and its growth has been little short of phenomenal, as the people of Toledo long since gave the company their unqualified approval. At a meeting of the directors of the company held recently, a most gratifying state of affairs was announced. It appears from the report that the cost of extensions and improvements aggregating $150,000 has come out of the earnings, and not from sale of treasury bonds, as anticipated. It was also reported that the exchange is now handling an average of 152,000 calls a day, or about twenty-two per telephone.



Toledo Home Telephone Company's Building.

Toledo Home Telephone bonds are in good demand in Toledo around 68½ to 69, and it seems it is impossible to supply the demand. Brokers have been endeavoring to hold the price down below 70 in order to fill orders. When it is considered that there are 1,165,000 of these bonds outstanding, and at least 1,000,000 of them held in Toledo, one cannot help but judge that most of this million are now in strong hands, as they are looked upon with more favor than at any time since the company has been in operation. This company has promptly paid its coupons and has retired about 20,000 of its bonds from the proceeds of its sinking fund.

As a method of instruction for its subscribers, the company has introduced what are known as visiting days, when all who care to call may inspect the exchange and apparatus. The first two visiting days were July 21 and 22. On this occasion more than 12,000 people took advantage of the company's invitation to thoroughly inspect the building, the exchange, switchboard and plant in general. Every visitor went away with a much clearer idea of the operation and management of the Toledo Home Telephone Company than they ever possessed before. The result was entirely satisfactory and the friendliest possible relations were established between the company and its employes and the subscribers.

Ten minutes after the doors opened, on the first day of the public reception, there was no room for doubt as to the success of the idea. In the cards of invitation which were sent through the mails the announcement was made that the reception hours would be from 10 o'clock in the morning until 9 o'clock in the evening; and promptly at 10 o'clock there was a long line of people waiting to be escorted through the exchange and accept the courtesies extended by this company. The management further stimulated interest in the reception by having the operators extend an invitation to the subscribers and their friends.

The visitors came promptly and kept increasing all day long; and contrary to the expectations of the company, the attendance on the second day was greater than that of the first. In all, it was estimated that something like 12,000 people went through the exchange. If they had merely come and gone away without any expression of appreciation, the success of the enterprise would have been problematical, but this was not the case. The vast majority of those who visited the exchange were not only intensely interested, but enlightened to an extent that amazed themselves, and their attitude toward the company when they left was decidedly more cordial and enthusiastic than when they came, and nothing but words of praise were heard for the management and the exchange.

The little booklet which the company distributed, with its pleasant and suggestive cover design, put everybody in good humor as soon as they looked at it; and they were in just the right frame of mind to take a kindly and favorable impression of everything they saw and heard. As far as it could be done without interfering with the regular routine of the business, all of the regular employes of the company were drafted on a general reception committee, and every visitor who came was made to feel that he or she was being given special personal attention.

The result of the experiment, as to this manner of interesting the public in an Independent enterprise, was apparent at once. Manager Stinson had not expected or intended to gain new business, or receive new orders for telephones, but a great many were voluntarily offered the company by visitors who had never been subscribers; and on the second day several business men who called gave the company definite orders for intercommunicating and private branch exchange systems.

The newspapers of Toledo were not only friendly, but took a great interest in the affair and the reception was given flattering editorial mention, the company being highly commended for its effort to bring about a better understanding of the telephone business, especially the service, on the part of the public. The following from the Toledo *Times* is a fair sample of the newspaper comment:

C. E. Stinson,
Manager Toledo Home Telephone Company.

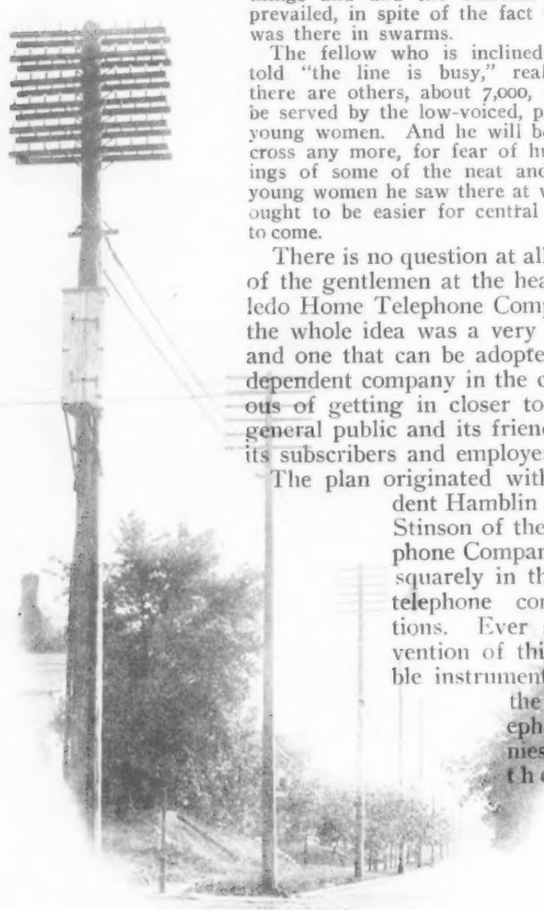
The reception given by the Home Telephone Company to its patrons and their friends was a highly successful and public-spirited innovation. We do not doubt that the company will get, in material benefits, all and more than it has expended to make the event a success. It deserves to do so, for the affair has been a real educational treat to the people of Toledo.

The average visitor may have gone away from the company's well appointed offices with a rather confused idea of cables and currents, switchboards, plugs, receivers, storage batteries and connections, but he will have for some time a lively recollection of the uniform courtesy of the employes, their painstaking efforts to explain things and and the business-like air which prevailed, in spite of the fact that "company" was there in swarms.

The fellow who is inclined to kick when told "the line is busy," realizes now that there are others, about 7,000, who, too, must be served by the low-voiced, patient, attentive young women. And he will be afraid to talk cross any more, for fear of hurting the feelings of some of the neat and sweet-looking young women he saw there at work Business ought to be easier for central for some time to come.

There is no question at all in the minds of the gentlemen at the head of the Toledo Home Telephone Company but that the whole idea was a very valuable one, and one that can be adopted by any Independent company in the country desirous of getting in closer touch with the general public and its friends, as well as its subscribers and employes.

The plan originated with Vice-President Hamblin and Manager Stinson of the Home Telephone Company, and it flies squarely in the face of all telephone company traditions. Ever since the invention of this indispensable instrument it has been the policy of telephone companies throughout the United States to shroud their operations in impenetrable mystery. The general public has never been given a glimpse of the interior workings of a telephone exchange, and the popular notion of what "Central" does and how she does it is about as vague and confused as it possibly could be. Even the newspaper descriptions which have appeared at rare intervals have published only those facts which the companies cared to have published and the most interesting and instructing details have been repressed.



Pole Line, Fourth Street.

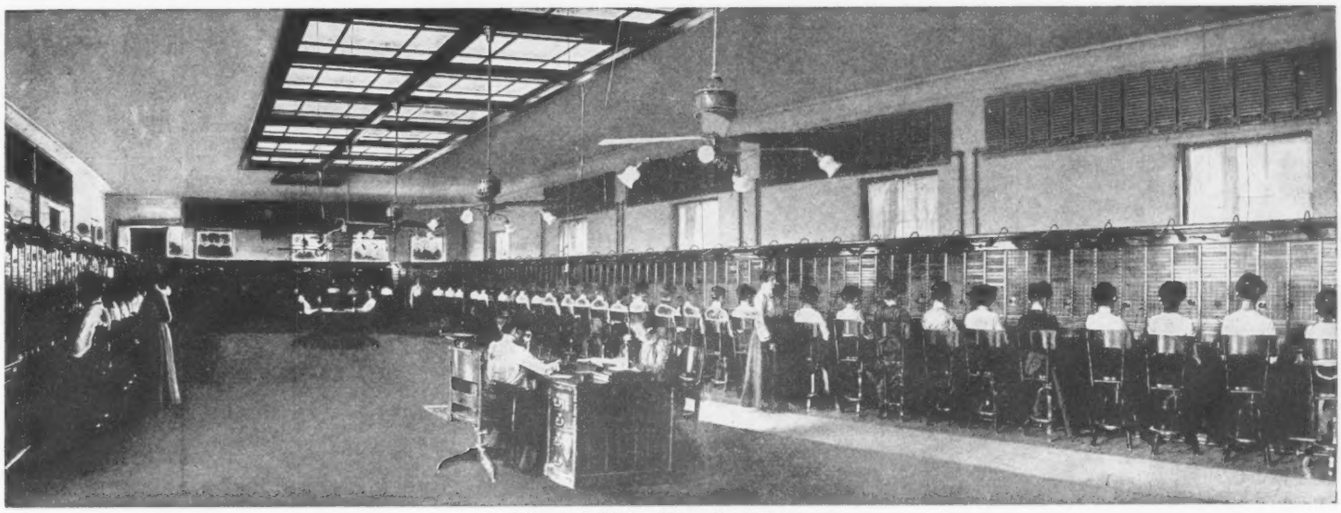
The management of the Toledo company arrived at the conclusion that not only is there nothing to be gained by keeping the public in ignorance of its operations, but that a great deal of sympathy, co-operation and good will goes to waste as a result of the old plan of suppression and concealment. Accordingly Messrs. Hamblin and Stinson hit upon the idea of a public reception. The clever little booklet, "Let's Talk It Over," was gotten up by these gentlemen and is a classic of its kind. It not only covers the field so far as Toledo is concerned, but contains innumerable pointers and suggestions of such evident value to managers of Independent exchanges throughout the country that TELEPHONY herewith publishes it in full, believing that its exploitation will advance the Independent cause and spur all those engaged in any way in the movement to still greater efforts. The text of the booklet is as follows:

This little book was written with a distinct and definite purpose in view. If it fails to accomplish that purpose it will not be from any lack of sincerity; for every sentiment expressed herein represents the honest convictions of the Toledo Home Telephone Company.

In order that you may have, at the outset, a perfect understanding of its object, let us confess to you frankly that it was prepared and printed for the sole purpose of winning your friendship. You may laugh at this, and say, "But my friendship isn't worth anything to you." That's where you are mistaken. Friendship is a force that never goes to waste—it has hands that reach out to help, and a voice that speaks cheeringly even in the silence. Have you ever listened to an actor, or an orator, or a musician, trying to force his way into the favor of a cold and unfriendly audience? You remember what a painful performance it was—how at first he strained and struggled? Then—presto!—without so much as a spoken word, or the slightest sound, a wave of wholesome sympathy surged up from the auditorium, and the man on the platform felt in every fiber of his being the uplift of a thousand hearts beating in happy unison with his own!

If we satisfy you that we are seriously and sincerely striving every day and every night—and every minute of every day and every night—to render you the most perfect possible telephone service, you *can't help* feeling friendly toward us. If you know that everything is being done, and absolutely nothing being left undone, to meet your telephone wants, you are bound, every time you take down the receiver, to think kindly of the folk at the other end of the line.

Now just try and imagine how much easier and pleasanter our work would be and how much more smoothly our splendid system would operate if 7,000 subscribers taking down their receivers 150,000 times a day, all had the same friendly feeling for the Toledo Home Telephone Company! That's what this little book is for. It's intended to break



View of Main Operating Room.

down the barriers that separate the subscriber from the company—to draw back the curtains, dispel the mystery, and show you the marvelous machinery of the Toledo Home Telephone Company working night and day for your convenience and comfort. In other words, we want to get close to you and we want you to get close to us. The American people are never unfair—when they understand. It is only when they are kept in the dark, hoodwinked and deceived, that they grow captious and critical. That's why we want you to get behind the scenes and see just how we are operating this plant.

In the olden days almost every telephone subscriber felt an instinctive antagonism toward the telephone company; and a readily-roused resentment against "Central" every time he rang the bell or answered a call. From Maine to California, and from the Coast to the Gulf, this same deep-seated dislike and distrust prevailed—and not without reason. The companies, more often than not, recognized the hostile attitude of the public, and did little or nothing to change or conciliate it. They controlled the situation, and had not yet learned the lesson that it pays to give good service—and to give it gracefully and not grudgingly.

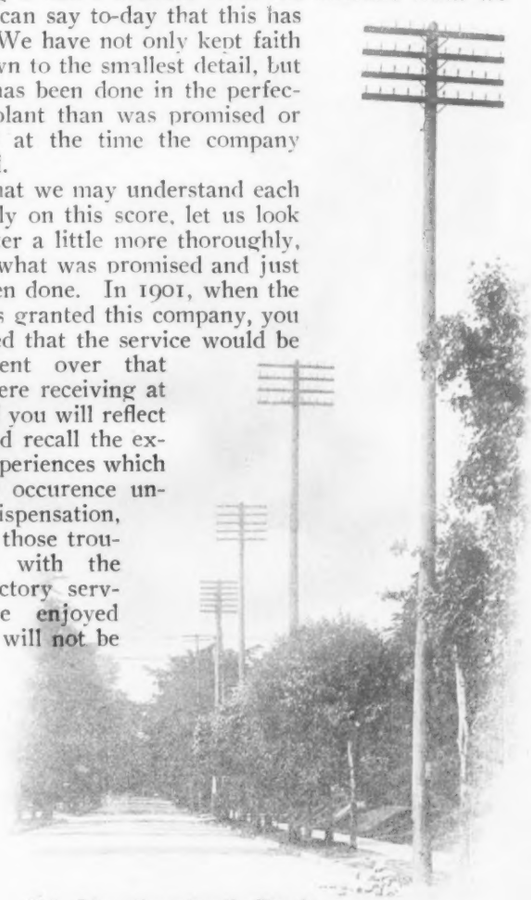
Presently, however, a new era arrived. The old order of things passed away. Powerful young companies inspired with the idea that the quickest and best way to gain and hold public favor was to earn and deserve it, sprang into the field and began to work a mighty revolution in method equipment, policy and service. The results of this invasion have been many and all have been characterized by the fact that every one of them made for improvement in quality and reduction in cost of telephone service. At present there are 234,000 telephones in Ohio, and of these 145,000 are operated by Independent companies and 89,000 by the Bell company. During the past three years there have been more patents, on improved apparatus, granted to Independent companies than have been granted to the Bell company in twenty years. The responsibility for improvement of the telephone service of this country can, therefore, be traced to nothing but the Independent telephone movement.

On the crest of this wave of improvement, the Toledo Home Telephone Company came into being. From its very inception it won universal sympathy, co-operation and approval. The time was ripe for a change and everywhere the solicitors went they were greeted with a smile and a handshake and a hearty "good luck to you." For years the people had chafed and fretted under the injustice and insolence of the old corporation and the welcome they gave to the new company, which came to offer them relief, was very much in the nature of a popular and patriotic uprising.

Seldom has the nation been given a more impressive object-lesson than was afforded by the defeat and downfall of the giant monopoly which had so long ruled with a rod of iron. Toledo's experience may be taken as a type of what happened in all parts of the country; for the same remarkable phenomena was in progress in hundreds of cities. Wherever and whenever the Independent movement was sincere and honest, the people rallied to its support as they did in Toledo, with eager enthusiasm; and the old selfish interests were routed, horse, foot and dragoons.

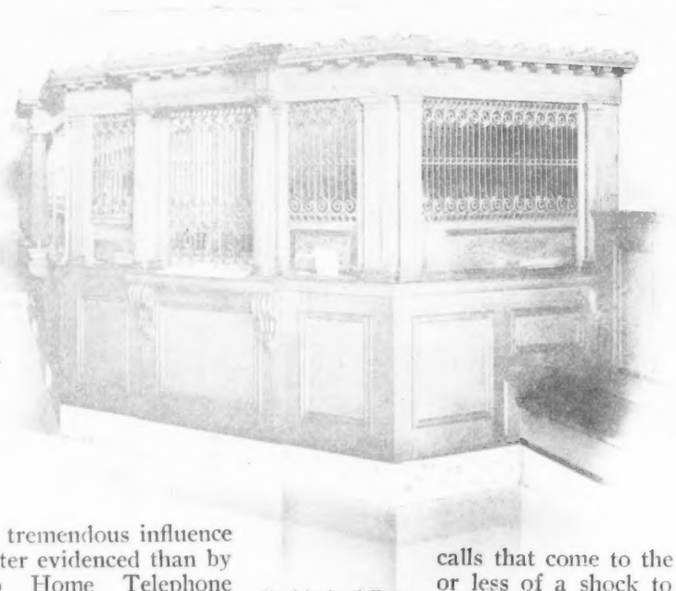
Happily, the Toledo Home Telephone Company was all that its name purported and implied—a home company, a majority of whose stockholders resided in this city and the smaller towns nearby; and the citizens had full confidence that every pledge would be carried out to the letter. Without departing a hair's breadth from the strictest truth we feel that we can say to-day that this has been done. We have not only kept faith with you down to the smallest detail, but much more has been done in the perfection of the plant than was promised or contemplated at the time the company was launched.

In order that we may understand each other perfectly on this score, let us look into the matter a little more thoroughly, and see just what was promised and just what has been done. In 1901, when the franchise was granted this company, you were promised that the service would be an improvement over that which you were receiving at that time. If you will reflect a moment and recall the exasperating experiences which were a daily occurence under the old dispensation, and compare those troublous times with the swift, satisfactory service you have enjoyed ever since, it will not be



Pole Line, Seventeenth Street.

necessary for us to emphasize the difference. If your memory is clear enough, you will recall maddening delays; a service that buzzed and roared in your ears and made the voice at the other end of the line sound a hundred miles away, and an arrogance on the part of the company rendering this inefficient service which rendered it doubly hard to endure. In the place of antiquated equipment and antiquated methods, you have been given all the time and trouble-saving devices which modern scientific progress has produced.



Cashier's Office.

In this connection, it might be well to say that the tremendous influence of the telephone cannot be better evidenced than by considering what the Toledo Home Telephone Company has done in Toledo—not for itself, but for the community. Contrast the number of homes in which telephones were installed three years ago with the number now in use, and we say, with all modesty, that the credit of reducing the price of telephone service, in Toledo, to a non-prohibitive point, falls to the Toledo Home Telephone Company. These results have been apparent to every telephone user in Toledo. The people of this city have accepted them as a matter of course and as something to which they were entitled—a legitimate right of which they had been deprived for years. They have been grateful and appreciative; but, naturally, little has been known by the general public of the tremendous amount of energy that was exerted in supplanting a bad service with a good one. For instance, it is doubtful if many Toledoans have known that the plant and equipment of the Toledo Home Telephone Company is not only a credit to this city and state, but really one of the very finest in the world. We want you to know all these things, because the knowledge is sure to inure to our mutual benefit. As briefly as possible, therefore, we want to tell you some things about the history of the Toledo Home Telephone Company which we believe will prove of genuine interest.

Much of this story is told in the illustrations, but the pictures cannot tell you, for instance, that the great switchboard in the operating-room—almost a miracle of mechanical accuracy—represents the largest initial installation ever made by a new company in this country. From the standpoint of human interest, this operating-room is the center from which emanates all the wonders of telephonic communication; and we feel sure that we are warranted in telling you just how "Central" does her work, and by what magic you are placed in almost instantaneous conversational connection with your fellow-subscribers.

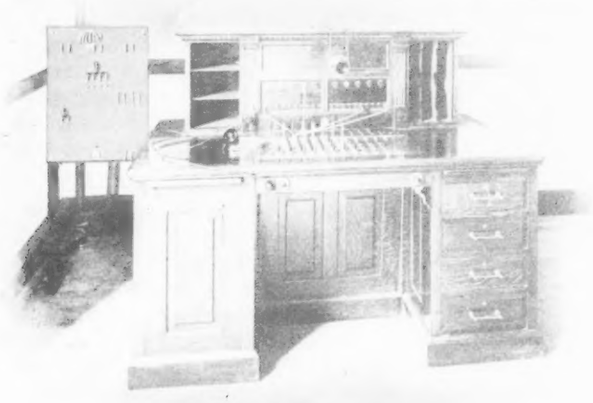
Operators' Lunch Room.

The strongest impression you will receive, when visiting our operating room, is the entire absence of clatter and noise. Think of one hundred girls all talking at once, but in such soft tones that the volume of their united voices does not produce a sound that can be heard two feet away. There are no jangling of bells, no sounds or confusion, and but little indication that at least one hundred pairs of hands are almost constantly flitting across key-boards and adjusting connecting plugs, and that one hundred voices are saying continually, "Number, please?"

You have, perhaps, unconsciously formed the habit of mentally picturing "Central" as a single young person who spends her time running from telephone to telephone, answering the calls that come to the main office. It will be more or less of a shock to you, therefore, to learn that there are something like two hundred "Centrals" in the Toledo Home Telephone Company's operating-room; that a steady average of 152,000 calls are received on every working day of the year; and that the busy fingers of these two hundred young women never cease manipulating for more than sixty seconds at a time the apparatus with which this tremendous volume of business is handled.

The method of operation of a large telephone system is merely a multiplication of the operations of a single operator. For instance, your number is 500. You wish to talk with some one whose number is 2,000. You take off your receiver, which makes an electrical connection and lights a tiny electric light in front of the operator. On the cap of this light is your number. The operator has a flexible wire (or green cord, as it looks to be) to each end of which are attached "plugs." When she sees your little lamp lighted, she knows you are calling and inserts one of the plugs in the hole in front of your lamp. Then she connects her receiver with your line and says: "Number, please?" You give the number that you want and she inserts the plug on the other end of the green cord, in the hole on the switchboard, which is numbered with the number that you want, and at the same time presses a button which rings the bell of the subscriber you want. When he answers, both little lights—your own and his—go out, and she knows you are talking to him. If his lamp remains lighted, she knows that he has not answered, and rings him again until convinced that the telephone will not be answered when she "cuts in" and says to you: "They don't answer." Imagine this operation going on repeatedly all day, and you'll not retain the idea that "Central is asleep."

The most marvelous development of the modern telephone is the switchboard. Each operator has a section of board in front of her occupying about twenty-one inches square and on the board she can make connection between any two of 8,700 telephones. The invention of, or the evolution resulting in, the production of this piece of mechanism, is of greater importance than was the invention of the telephone itself. The switchboard employed by the Toledo Home Telephone Company is of the latest type. The present capacity is 12,500 lines and at present 7,000 lines are in use. Some idea of what is involved in furnishing prompt service to 8,700 telephones may be obtained by consideration of what is necessary in the way of mechanical equipment in the Toledo Home Telephone Company's exchange. The number of "multiple jacks," as the telephone men call the holes in which the plug is inserted, is 182,000, to which are added 7,050 "answering jacks," or connections from



Private Branch Exchange.

the exchange to the subscriber; 1,950 "trunk jacks," or trunk wires connections. This makes the total number of "spring jacks" 191,000. A "spring jack" is the term telephone men employ to describe the mechanism used in making those connections which are not permanently made and soldered, but which are made by "plugs" in the hands of the operator. The total number of connections in the exchange is 1,792,170, and the total number of underground wires is 19,600. To keep this complex mechanism in the first-class order essential to good service, is one of the problems with which the company is confronted every second in the day; and that this *is* done is evidenced by the quality of service which the Toledo Home Telephone Company is providing.

If you have ever gleaned from the pages of the comic papers the idea that "Central" is a languid young woman who spends half her time gossiping with her fellow-workers and follows her own sweet will about answering your call, you have innocently been doing a great injustice to one of the most industrious bodies of workers in the world. The truth of the matter is, that laziness or inattention on the part of the operators is almost a physical impossibility under the perfect system which prevails in the offices of the Toledo Home Telephone Company. With calls being registered by 8,930 tiny electric bulbs on the switchboard almost as rapidly and regularly as the clock ticks off the seconds of the day and night, and each and every call demanding the movement of both hands and the strained attention of eye, ear and brain, "Central" simply cannot neglect her duties. If she were to falter for so much as sixty seconds, calls and complaints would pile up with such amazing rapidity that she would either collapse, and give up in despair, or be immediately removed from her position by the watchful supervisor whose duty it is to pace steadily behind the long line of operators and aid or correct them in their work. We cannot impress this fact too forcibly upon your mind—"Central" cannot shirk her work. She dare not turn her head nor swing her chair from the board. She cannot delay the fraction of a second beyond the absolutely necessary time in answering your call; because the remorseless mechanism of the switchboard, and the checks and guides of the office system are constantly urging her on to the swiftest possible performance of her duties.

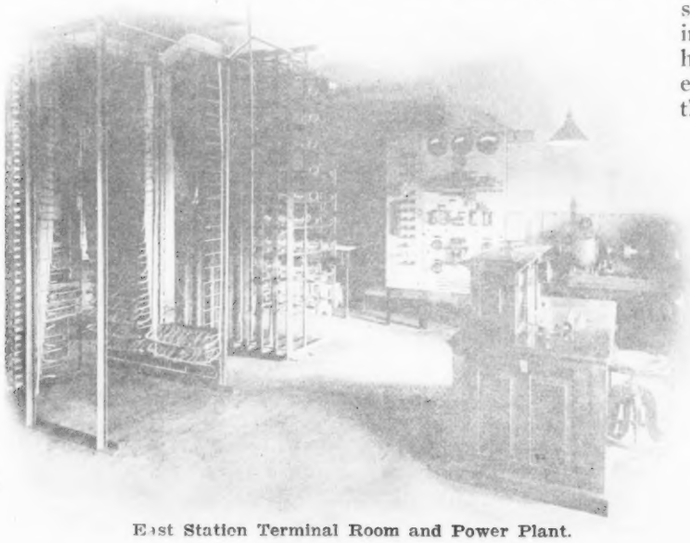
Some girls, of course, are more expert with their eyes, ears and fingers than others, but all of them, without exception, are driving ahead at the very highest speed of which they are capable. They realize, one and all, that upon their speed and proficiency—solely upon these things—depends the salary they earn. They realize, too, that while the company is quick to recognize this skill, it is also bound, in the interests of the public, to be merciless in removing those who prove incompetent; and that at the first evidence of carelessness or inability they will lose their positions.

"Central" is doing the very best that human nature (aided by machinery that is almost human in its operations) can do—you can absolutely depend upon that. Besides the compulsory operations of the switchboards; besides the inspiration of higher wages for greater proficiency; besides the watchful supervision of the supervisor, and the critical inspection of the chief operator, there are still other safeguards and precautions.

Over in one corner of the operating-room sits a young woman whose desk contains a special switchboard. She is called the "monitor" and her duties are very much the same as those of the envied young person who occupied that position in our early school days. She wears a receiver like the other operators and remains at her place all day in apparent idleness, save for the notations which she makes from time to time on the pad in front of her. As a matter of fact she is one of the busiest young women in the room; for her switchboard enables her to hear the conversation of every operator in the room. If an operator should be so unfortunate as to indulge in any impertinence or impropriety—an exceedingly rare occurrence, by the way—or should prove persistently negligent in any way, the "monitor" in the corner knows it, and makes a notation to that effect. Thus, the manager of the Toledo Home Telephone Company, through these various ramifications, knows to a nicety the capacity, the speed, and the disposition of every operator in his employ.

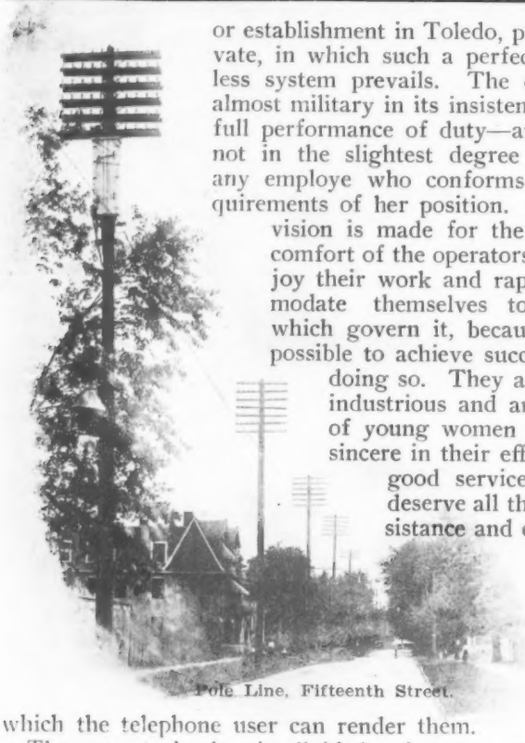
And the supervision does not end here. The manager himself keeps the operators under constant and vigilant scrutiny without leaving his office. He, too, can connect immediately with every operator in the room upstairs. This he does, perhaps a dozen times a day, without their knowledge, keeping an absolute check upon the quality of service they are rendering.

It is perfectly safe to assert that there is not an institution



East Station Terminal Room and Power Plant.

Operators' Rest Room.



Pole Line, Fifteenth Street.

or establishment in Toledo, public or private, in which such a perfect and flawless system prevails. The discipline is almost military in its insistence upon the full performance of duty—and yet, it is not in the slightest degree irksome to any employe who conforms to the requirements of her position. Every provision is made for the health and comfort of the operators. They enjoy their work and rapidly accommodate themselves to the rules which govern it, because it is impossible to achieve success without doing so. They are a cheery, industrious and amiable body of young women who are so sincere in their efforts to give good service that they deserve all the kindly assistance and co-operation which the telephone user can render them.

The operator's day is divided, of course, into regular shifts and the changing of these shifts is a matter much more complicated and important than it sounds. The operators in charge do not dare to leave their seats until the incoming force are all ready to occupy them immediately. Accordingly, when one force is about to retire, and another to take its place, there ensues a very rapid and pretty piece of military drilling. The incoming operators form in line, each girl being allotted a special place in accordance with the position of her chair at the switchboard. Thus the first girl in line entering the door will occupy the last chair on the march around the horseshoe curve described by the switchboard; the second girl the second last chair, and so-on down to the last girl, who occupies the first chair in the room.

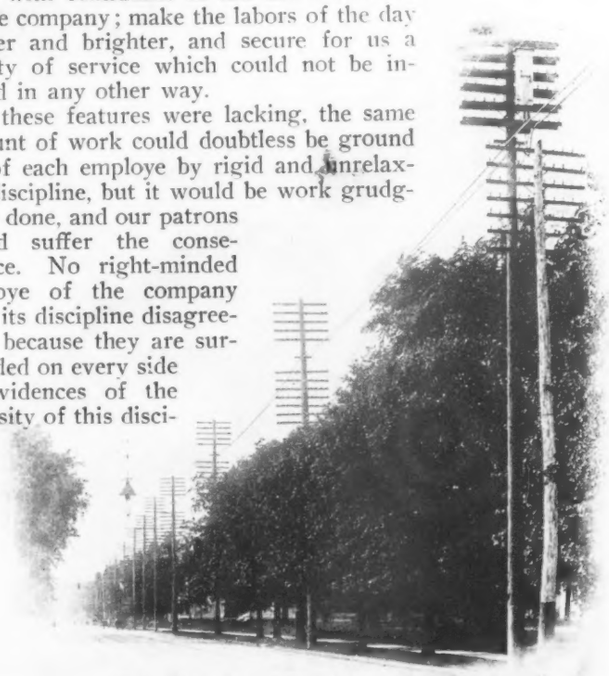
When the operators have marched around the room and taken a position at the back of their respective chairs, the girls occupying the chairs at a given signal make two moves—leaving their seats—while the newcomers slip into the places left vacant. Brief as is the interval which elapses from the time the shift is commenced until it is accomplished, it is none too brief, for the bright little electric bulbs are flashing "calls" with marvelous rapidity from all parts of the room. Just how rapidly these calls come, those with a mathematical turn of mind can figure by estimating the number per minute, taking the average day's total of 152,000 calls and bearing in mind that the bulk of the business is congested into eight hours or less.

Another illustration of the tremendous business which the office handles with ease and expedition is furnished by the number of calls received by the "information operator." In the telephone directory, despite the great care exercised in its preparation and constant revision, there are usually from five hundred to one thousand names which prove a source of confusion to the hurried user of the telephone. Changed addresses; new telephones installed that do not appear; similarity of names, and a dozen other apparently trifling details contribute to the burdens of the "information operator"; and the number of calls which she receives every day reaches the enormous average of 20,000. The next time you ask for the "information operator," remember this astonishing total, and you will appreciate the speed with which she replies to your question.

An all-the-year-round difficulty with which the company has to contend is the quite general habit of the subscriber of leaving the receiver down. No matter what time of the day you might step into the operating-room you would always find in what is known as the "hospital board" an astonishing number of plugs removed from their accustomed place with the cords to which they are attached pulled out at full length. This simply means that something like fifty residents of Toledo leave their receiver off of the hook every day in the year. There's no chance for a mistake—not the slightest. The office knows as soon as your number is called whether or not the receiver has been taken down and not replaced. Subscribers protest and vow that they did not leave their receiver off of the hook. Husbands complain bitterly that they cannot call up their homes from their office and wives protest that it is not their fault. "Central"—with the positive and irrefutable proof of the switchboard before her—knows that the subscriber is at fault, but she says nothing. It is simply her duty to do her duty and—say just as little as possible.

The Toledo Home Telephone Company is not in any sense a philanthropic institution, but the management believes firmly and heartily in the value of pleasant surroundings and considerate treatment for its employes. It has been our experience that in order to get the most satisfactory results in the way of service, every kindness should be shown our operators, for the power lies with them to make an exchange a success or a failure. We realize that the young lady employes in our operating room are our most valuable asset and should be treated accordingly. It is this spirit manifested by the Home company toward its employes that has aided in its success. We take no credit whatever for the little conveniences with which our working force is provided. It is purely a matter of getting the best possible service from every one in our employ. The operators' dining-room on the second floor; the complete little kitchen where warm food is prepared; the pleasant little lounging-room with its cheerful appointments; the perfect toilet arrangements and cloak-room accommodations—all these unusual features are of as much value to us as to our employes. They inspire our working staff with confidence in the fair intentions of the company; make the labors of the day lighter and brighter, and secure for us a quality of service which could not be induced in any other way.

If these features were lacking, the same amount of work could doubtless be ground out of each employe by rigid and unrelaxing discipline, but it would be work grudgingly done, and our patrons would suffer the consequence. No right-minded employe of the company finds its discipline disagreeable, because they are surrounded on every side by evidences of the necessity of this disci-



Pole Line, Cherry Street.

pline; and of the right and generous disposition of the company. The old way of getting results was to browbeat work out of the worker—the new way, as exemplified in the Toledo Home Telephone Company, is to labor along the lines of least resistance and enlightened selfishness.

So far we have discussed the Toledo Home Telephone Company largely from the standpoint of sentiment and human interest. We want you to know, in addition to this, something of what it represents in the way of investment and equipment and as an important industrial enterprise for Toledo. The company is capitalized in the amount of $2,500,000. The birth of the idea itself can be traced back beyond the actual organization of the company, to the dissatisfaction of Toledo business men with the telephone treatment which they were receiving up to the year 1901. The practical application of their idea was effected by the Central Construction Company, which carried out the entire process of organization, construction and operation.

East Station.

The history of that company, which has since grown to gigantic proportions, is so unique and remarkable that it is well worthy of a biography by itself. The genius that brought the little town of Wauseon, Ohio, into the bright light of financial fame as a national center of telephone promotion and organization represents a subject so intensely interesting that it tempts the writer to digress. But that story will doubtless be told at some other time and in some other place and the barest outline must suffice herein. It is enough to say that the town of Wauseon, Ohio, is known wherever Independent telephony is discussed—equally as well known to the financial giants of the telephone world as to the linemen working in the streets. The presiding genius of the Central Construction Company in its inception, as at the present time, was Edward L. Barbour, and with his name throughout its history has been linked the name of James S. Brailey, Jr. It is necessary to confine this account to the operations of the Central Construction Company as they apply to the Toledo Home Telephone Company, but it may be well to chronicle the fact in passing that the same company has since installed Independent plants in fifty-seven cities and towns, the complete list being as follows:

Ohio—Elyria, Clyde, Bucyrus, Troy, Napoleon, Bradford, Hicksville, Delta, Put-in-Bay, Springfield, Paris, Conneaut, Delaware, Kenton, Sidney, Wauseon, Washington C. H., Defiance, South Charleston, Port Clinton, Toledo, Wellington, Tiffin, Piqua, London, Urbana, Bryan, Greenville, Bellefontaine and Carey.

New York—Utica, Illion, Rome, Frankfort, Cortland, Herkimer and Homer.

Indiana—Richmond, Goshen, Elkhart, Seymour, New Albany and Bedford.

Kentucky—Lexington, Louisville, Nicholasville, Frankfort, Midway, Versailles and Paris.

Michigan—Adrian, Morenci and Tecumseh.

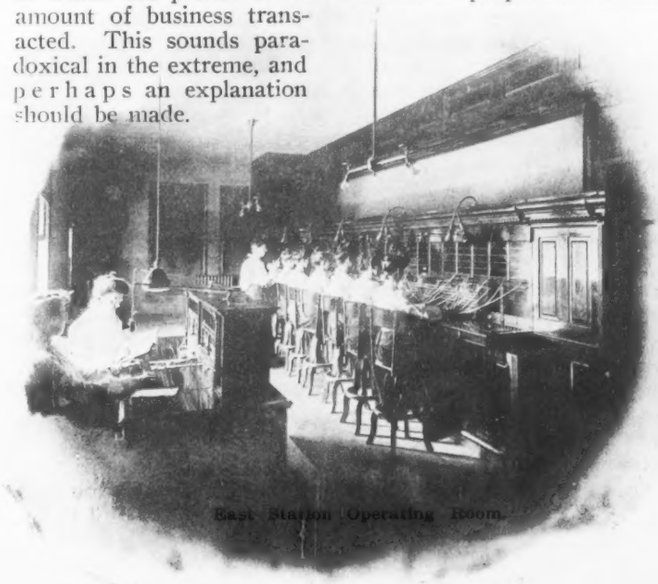
Also at New Decatur, Alabama; Huntington, West Virginia; Kansas City, Missouri, and Kansas City, Kansas.

An idea of the growth of the toll system may be more comprehensively conveyed by citing this one illustration: From six to seven o'clock in the morning—when you have just awakened—truck-farmers, gardeners and fruit growers are telephoning to the commission houses and grocers "selling their product by wire." This one end of the business has grown to such volume that it is necessary to employ ten extra operators to take care of the business during that time. Consider what that service means both to the farmer who finds his market before hauling his produce to town, and the commission man who secures his stock and knows its price before he makes quotations to his early morning customers.

As rapidly as they can be put into effect, many innovations and improvements are being adopted, which will prove a source of great convenience to the subscribers. As an instance—it is now possible for any patron of the company to call up the office and learn just who has called him up during his absence from the house or office. An accurate and complete record of such calls is being kept and the information will be promptly and gladly furnished.

Again, if a fire should be reported from any building occupied by a subscriber of the company as tenant, the subscriber, if he have a telephone at his home, will be immediately notified by the Toledo Home Telephone Company. This valuable feature, which, of course, costs our patrons nothing, will give business men a sense of security which they will appreciate immensely.

If you have read thus far, aren't you beginning to get a clearer and better insight into the persistent painstaking and patient effort that is being made by this company to serve you not only well, but extraordinarily well? We're succeeding, too, and pleasing you. We know it from the pleasant relations that exist between the company and its patrons, and the hearty thanks we receive for little courtesies which we are always glad to extend. The criticisms are very, very few—but it's our ambition that they shall disappear altogether, and, as we have said repeatedly thus far in this little book, that we shall have an army of staunch, loyal friends in Toledo and all around Toledo. Not until that time shall have arrived will this company come into its share of the result of installing and operating this, the finest telephone exchange in the state and one of the finest in the United States. This statement seems contradictory to the foregoing contents of this book, but the telephone business is a commercial anomaly. It is the only business in which the profits do not increase in proportion to the amount of business transacted. This sounds paradoxical in the extreme, and perhaps an explanation should be made.


East Station Operating Room.

In starting a telephone company the price of service is based upon the cost to the company of furnishing this service from an exchange of an estimated number of lines. When you increase the number of these lines beyond the point contemplated by the company, you do two things: First, you necessitate the connection of every line previously installed, to the new line, which means in the exchange of the Toledo Home Telephone Company, that every time a new line is added, 7,000 connections must be made. Second, you increase the amount of service over each line, thereby increasing the cost of operating each telephone. That is one item. Another item is that in an exchange of 10,000 telephones you demand, and are entitled to, just as good service as you received when the exchange had only 3,000 telephones, notwithstanding the fact that there are about three times as many calls on your telephone in the large exchange as there were upon your line when the exchange had 3,000 telephones.

Cover Design in Miniature.

There must be devised ways of handling this increased number of calls upon your telephone, and give you just as quick service as when there were only one-third as many calls to handle. To do this necessitates the installation of apparatus that will facilitate handling the business on your line, and what is true of your line is true of every other line in the exchange. The girl can handle only so many calls a day, and when the number of calls on each telephone increases, she can handle fewer of these telephones. This means the employment of more girls. Therefore, after an exchange has grown beyond a certain point, the cost of operation, maintenance and equipment of each telephone is greater than it was when there were fewer telephones.

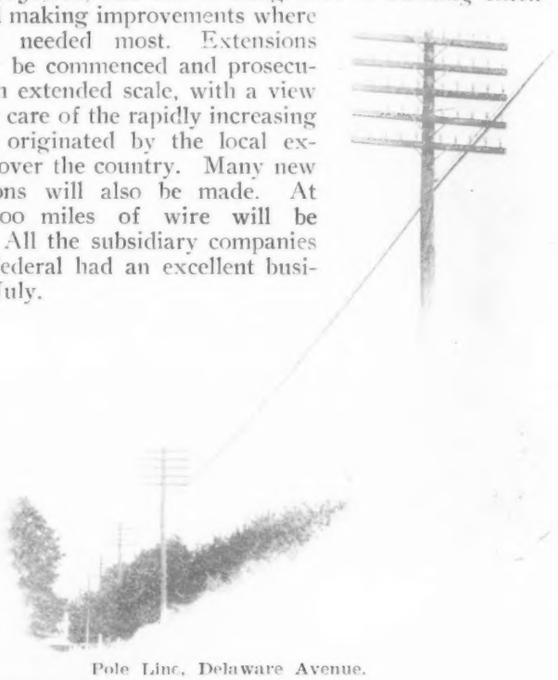
Perhaps the one improvement in telephone service in Toledo that has worked the greatest good to the commercial life of the town is the installation of private branch exchanges in business houses. The convenience and time-saving value of this private exchange can hardly be overestimated. In fact, they have become one of the necessities of the equipment of a modern business house. By use of one of these private exchanges, communication may be had between every office, every desk, every floor, and every department, in addition to connection with every one of the 8,700 telephones to the exchange. One of the greatest conveniences of this system in a large establishment where many people are using telephones during the day—is that several people may be talking to outside persons at the same time and yet you can get the operator of the private exchange, and if your man is not telephoning to some one else you can talk to him. Toledo houses which have installed these private exchanges are loud in their praise of the same.

In conclusion, we can only say that the publishing and distributing of this book was inspired by exactly the same motives that have actuated the Toledo Home Telephone Company since its inception—fairness to its subscribers. We wanted you to know just "how it was done," and we feel sure that you now are closer to us, and we to you, than we were before you visited the exchange and read this little book. We will be amply repaid for the cost of this work; we feel sure of it, because, when you telephone again, you'll know that there are something like 250 people working every minute of the day and night to give you all you are paying for and a little more. Don't be afraid to offer suggestions or criticisms. We'll welcome them. If your telephone does not work properly, promptly notify the trouble clerk. If by any chance the trouble is still not remedied, report to the manager. We're here to give you value received and you'll be doing us an injustice by suppressing any occasion for dissatisfaction.

FEDERAL COMPANY MAKES BIG DEAL.

President F. S. Dickson of the Federal Telephone Company of Cleveland completed negotiations last week through which the John A. Roebling's Sons Company of Trenton, New Jersey, and the Standard Underground Cable Company of Pittsburg agreed to take United States Telephone bonds at 85 and accrued interest in payment of their claims, aggregating $624,000. This leaves $900,000 claims in the hands of outside persons and $2,000,000 due the Everett-Moore syndicate. The first will be paid off as soon as possible, and it is thought this will take but a short time. Several plans have been formed for taking care of the syndicate claims. When President Dickson took hold of the property the debts were about $4,000,000, and it seemed that the settlement was a long way off. As the Federal was a holding company, it was at one time thought best to get rid of all the properties in which it was interested. Many of them were sold and others may be, but it would seem that the syndicate will come out with considerable interest after the debts are all discharged.

In connection with this, the announcement has been made that a syndicate of Cleveland and New York bankers has arranged to loan the United States Telephone Company $450,000 for a term of three years at 6 per cent. Collateral of the United States company is given as security. The company is now earning $400,000 a year and it is estimated that the new money will place it in position to add to this, as the only thing lacking is a more extensive system to take care of the business offered. Some months ago the company secured $150,000, and this is being used in building extensions and making improvements where they are needed most. Extensions will now be commenced and prosecuted on an extended scale, with a view to taking care of the rapidly increasing business originated by the local exchanges over the country. Many new connections will also be made. At least 9,000 miles of wire will be strung. All the subsidiary companies of the Federal had an excellent business in July.



Pole Line, Delaware Avenue.

Concerning Telephone Lines

SAMUEL G. McMEEN.

TESTING AND FAULT LOCATION.

IT IS often necessary to practice insulation tests on lines which are not yet brought into a building, and as one may have to go from town to town on such work, it is of advantage to have the testing outfit light enough to be portable, and strong enough to stand handling and shipment. Improvement is still going on in testing apparatus, although it was reasonably well developed long before the invention of the telephone. A very instructive idea of its present condition and of detail construction and methods of use, can be had from the catalogues of instrument makers, and the student is earnestly recommended to use that method of learning about the art.

One of the most delightful forms of insulation testing sets is that made by Nalder Brothers, London. The arrangement of the parts and the circuit are both a trifle unusual, and are shown in the accompanying drawing for insulation tests. A notable feature is the absence of keys. The only parts requiring to be moved by hand are two switches, one controlling the taking of the constant and the actual testing, and the other applying the galvanometer shunt in its varying degrees. The shunt is subdivided in smaller units than usual, and the switch method enables it to be used with much greater speed than if the plug form were chosen. With such a set, the operation is to take the constant by throwing the main switch to the left and moving the shunt switch until the largest deflection which will be on the scale is found. Suppose that this deflection is 320; suppose the shunt to be on the 1/1000 point at that time; then the constant will be 32,000, because the resistance through which the constant was taken was 1/10 megohm (320×1,000×.1 =32,000); throwing the switch to the position marked "test," deflections may be taken on the various wires and their insulation found at once by dividing 32,000 by the observed deflection, multiplied by the shunt multiplier used. For instance, if after taking the constant as above, one were to test a wire upon which the shunt switch stopped at the 1/10 point, giving a deflection of 64 divisions, 640

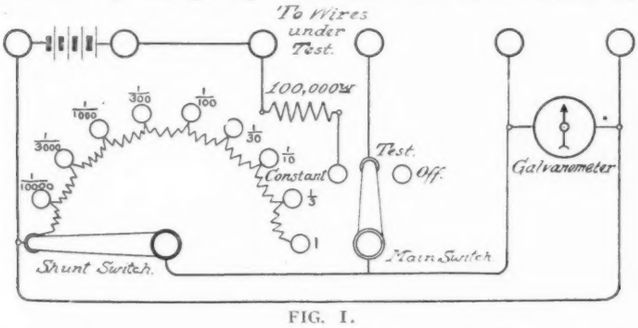


FIG. 1.

would represent the deflection which would have been given with no shunt, and this is contained in 32,000 fifty times; therefore, the insulation of the wire under test is 50 megohms. For convenience in other tests the galvanometer terminals are brought out to binding posts, as well as being permanently wired into the circuit of the set.

A minor, but attractive feature of this set is its compactness; the reading of the galvanometer deflection is by means of a telescope, through which the worker sees the image on a scale, rather than by watching the movement of a spot of light on a scale. The telescope is small, only about 3½ inches long, and the scale is short and finely graduated. The telescope's high power enables the divisions to be clearly read.

In any of the reflecting types, the use of the apparatus requires reasonably intelligent care not to pass large currents through the windings. With such precautions, pressures of several hundred volts may be used with safety.

In the circuit for insulation tests, illustrated in the August article, the 100,000 ohm standard resistance was shown to be left in the circuit during the test as well as when taking the constant. This prevents injury to the apparatus by getting on a very poorly insulated or grounded wire. It is quite customary to arrange sets in this way, for that reason. Where it is necessary to get quite accurate results, 1/10 megohm must be deducted from the result when the test is completed.

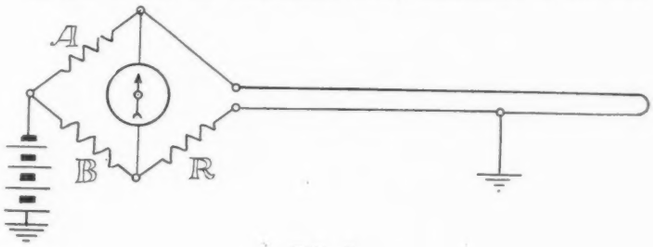


FIG. 2.

In the foregoing methods of testing insulation resistance, the principle has been that of sending current to the conductor and through the insulation, and noting the effect of that current on some movable thing under its influence. In a method described by Carhart and Patterson in "Electrical Measurements," and by Gray in "Absolute Measurements in Electricity and Magnetism," another principle is involved. It is that of loss of charge, and is practiced by charging the conductor under test to a definite potential, allowing a known time to elapse, then testing to see what potential remains. It will be seen that this is a practical way, when it is remembered that an insulated conductor must form a condenser with reference to something, even if it hangs in air and the other condenser conductor is the earth. But if the conductor under test is not perfectly insulated, a potential to which it is charged must diminish by the leaking away of the charge; so that after a sensible time the loss may be known by observing what is left. A calculation will then tell what insulation resistance exists to allow that loss with the known time and charge. The method has the practical advantage that a sensitive millivoltmeter is a suitable instrument for the purpose, and is readily portable. A direct current power-source may be used for the charge. If much work is done with the method, tables or curves may be laid out, enabling calculations to be omitted by the observer, and insulations read at once.

In the descriptions of tests for insulation resistance, in this and the last article, the testing of lines has been most in mind. It is also necessary to test materials and apparatus for insulation resistance. Particularly is this necessary on all structures that may ever be used on long lines; a "leak" of so small an amount as to seem ridiculous to the novice may make a long line noisy; and this is more likely to be so if several of the articles of low insulation are connected to the same circuit.

[Note.—This is the fifth of a series of articles by Mr. McMeen. Succeeding articles will treat of electrolysis of underground cables, and of other important matters having to do with the construction, maintenance and operation of telephone properties.]

In the making of materials and the processes of turning them into apparatus, slight changes of method sometimes make startling differences in the results. An instance of insulating plugs, having metal punchings molded into them for terminals, showed that excellent rubber had been used in the plugs, but the insulation resistance between the punchings was very low indeed. The cause proved to be the use of graphite (black lead) in the metal mould, and a very thin and invisible film of it had coated the rubber plugs. The remedy was obviously to stop using graphite on new plugs and to clean it from those already made. But as they were in service on the tops of poles out of doors, this was not a simple matter.

Two of the three things which happen to working wires are to become grounded and to become crossed with other wires. Both of these troubles may be located by means of the Varley loop test, the circuit of which is shown in the accompanying drawing. There are many methods of making ground locations, but of them all the Varley test and the similar one designed by Murray are those best adapted for general use, principally because they are free from errors which might result from the existence of earth potentials. The pieces of apparatus used in the Varley test are the usual Wheatstone bridge, rheostat and galvanometer. It is not necessary that the latter be of the reflecting type, although in some cases it may be found convenient to use one of that sort. Portable sets containing not only the three parts of the testing set, but a battery as well, are on

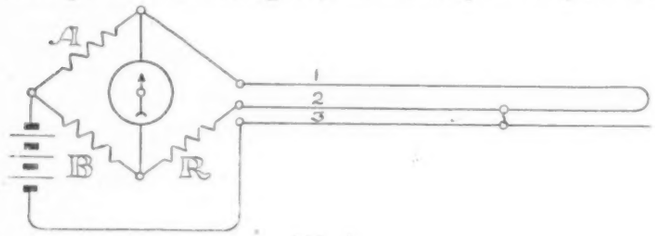


FIG. 3.

the market, and remarkably successful locations of grounds and crosses are possible by their use.

Referring to the figure showing the Varley test for grounds: the arrangement is of the Wheatstone bridge type in which it is intended that the current from the battery shall flow through two paths, and at the point of completing the test shall cause no deflection of the galvanometer. In the figure, A and B are the two bridge resistances; R is the rheostat (the resistance of which may be varied at will by plugs or switches); the battery, galvanometer and ground can be recognized by form. The test requires the use of one extra wire besides the one having the ground fault on it, and this extra wire must be clear of faults. Fortunately, in telephone work, wires generally go in pairs, and one often is good when the other is bad. The two wires must be directly connected together at the distant end.

If the two wires are alike, and the resistance of the bridge arms A and B are equal to each other, the galvanometer will show no deflection when the resistance in the rheostat R is equal to twice the resistance from the ground to the distant end. This is the simplest form of the test, and on a long line, may give valuable help in knowing just about where to find the ground. The rheostat being adjustable in ohms, however, one cannot get results to fractions of an ohm unless the bridge arms are in another ratio than equal. And as the result, in integral ohms, may be half an ohm wrong, with No. 10 B. & S. gauge wire the location may be wrong by 500 feet or so. If this will do well enough, it is simplest to remember the test by the following rule, suitable *when the two wires are alike*:

Use equal bridge arms; adjust the rheostat till no deflection, or the least deflection, exists; divide the resistance cut in at the rheostat by two; the result is the resistance from the ground to the distant end of the line.

No. 10 B. & S. gauge and No. 12 British gauge hard drawn copper wire has a resistance, roughly, of 5 ohms per mile of wire, or 10 ohms per mile of metallic circuit. For such lines, which are quite usual for toll service, this rule is quick and good:

With equal bridge arms, balance as usual; divide the resulting rheostat resistance by 10 (or point off the righthand figure); the result is the distance in miles from the ground to the further end of the line.

The reason for so persistently writing of "the further end of the line" is simply that in this test, under these condi-

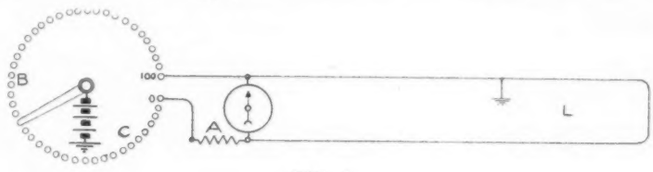


FIG. 4.

tions, the figuring is much more simple so, and it is true that in the average of things the trouble location will be just as well known in that form as in miles from the observer.

The Varley test for crosses (see the figure) is quite the same as for ground, except a slight difference in the arrangement of conductors. The battery is connected to one of the crossed conductors (3); the rheostat is connected to the other (2); a good wire (1) is connected to the set as in the test for ground, and is looped to the crossed wire (2) at the distant end. The further operations are by the rules given for grounds.

The Varley test with bridge arms of a ratio other than equality will give results to such a fraction of an ohm as may be desired. As apparatus is usually made, bridge arm relations may be selected so that A is to B as 10 is to 1, or 100 to 1, or 1,000 to 1, or the reverse. Suppose them to be arranged so that B is greater than A, say 10 or 100 times, and the two wires in the test to be of equal resistance. Then having adjusted the resistance in the rheostat until there is no deflection in the galvanometer, the equation of the resistance *from the observing point* to the ground is

$$\text{Thus: } x = \frac{2BC - AR}{A + B}$$

in which C is the resistance of one wire to the distant end. Stated in other terms, the resistance to the fault may be determined thus:

Multiply the resistance of bridge arm B by that of the good wire, and double the result; subtract from this the product of the resistances of arm A and of the rheostat; divide the remainder by the sum of arms A and B.

As a practical example: A line 35 miles long is made of two copper wires of 175 ohms each, and one has a ground on it at some place unknown; the bridge arms, in testing,

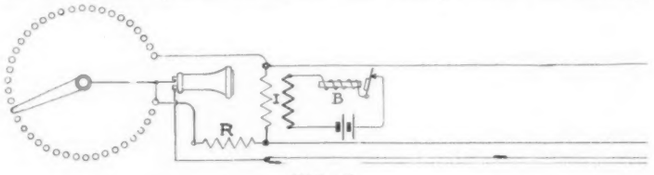


FIG. 5.

are 10 for A and 100 for B; a balance is reached with 2,015 ohms in the rheostat. Then by the last rule, 100 times 175 times 2=35,000; subtracting 10 times 2,015, leaves 14,850; dividing by 100 plus 10 equals 135; this is the resistance in ohms to the fault. In the case of a cross, the result is figured quite in the same way.

If the records tell the resistance of all principal lines under good conditions, the location of the fault can be accurately figured. It is hardly enough to know the theoretical resistance per mile of the size of wire used. The actual resistance ought to be known and used.

The test with the dial form of the circuit is a simple Murray test. S. A. Rhodes of Chicago has designed a very simple and satisfactory portable set for this purpose. The dial, the arm of which swings one end of the testing battery, has 101 points in the circle; a resistance coil of one ohm is connected across each gap between points; there are thus 100 such coils. The coil A is of the same resistance, 100 ohms, as the total of the 100 coils in the circle. Then with a loop of one good wire and the faulty one, the switch lever is turned till the galvanometer deflection is nothing. If the ground is one ohm or more from the extreme further end of the looped wires, at least one step from zero will be required to balance the needle. The amount the switch is turned from zero is marked C in the figure; the remainder of the circle is marked B; the loop resistance may be called L. Then the equation is

$$x = L\frac{B}{B+C+A};$$

but B+C+A equals the sum of all resistances in the set, or, in this case, 200 ohms; so it is easy to express the conclusion in simple English:

Multiply the loop resistance by the steps between the switch and the end; divide by 200. The result is the resistance in ohms from the point of testing to the fault.

To trace the following case with the aid of the figure will aid in clinching the principle in one's mind:

Loop resistance, 84 ohms; distance switch lacks of reaching the end, 68 coils; then the resistance to the fault is 68 times 84 miles divided by 200, equaling 28.56 ohms. From this the distance in feet or miles, as desired, can be computed.

Such a set and such a method are suitable for a great deal of the rapid testing required in cable work. In multiple cable distribution the opportunity for troubles multiplies because the points of emergence of the conductors are more numerous. In a pair of wires tapped out at a number of places, the tying together for test should be made at the outer end first, and then at nearer points.

Besides being grounded and crossed with other wires, lines may become open. A break in a wire, if it is a bare aerial one on poles, may result in one or both ends becoming grounded. In some such cases, the location of the break can be located by a method for grounds. In some other cases, one of the ends may be crossed with another wire, and the method for locating a cross may enable the location to be made. In cables, however, the opens are often merely breaks with no ground or cross to assist the test. Then the test must be based on a comparison of electrostatic capacities.

Referring to the article in the August issue, the method of measuring capacities will be found. By applying such a test to the broken wire, and also to a good wire of the same size, length and of similar surroundings, a comparison of the two results will give the length of the defective piece. The good wire must be open at the distant end. Suppose that a toll line 45 miles long, of two No. 10 B. & S. gauge wires, has one wire broken; this wire is found by test to be clear of ground at the break. A test for capacity on the good wire, opened at the distant end, gives .2925 microfarads for the whole piece; a test on the broken wire gives .1172 microfarads; then the distance to the break, in miles, is 45 times .1172, divided by .2925, equaling 18 miles and a little over; to be quite exact, 18 miles, 162 feet, 1 inch plus. In a word, the rule for the distance to the break is: *Multiply the total length by the ratio between the bad wire and good wire capacities.*

Another method for locating a break in a conductor, particularly adaptable to conductors in cables, utilizes the apparatus designed by Mr. Rhodes, and described with reference to the Murray system for locating grounds and crosses. For use in locating breaks, the set is associated with a telephone receiver instead of a galvanometer. The current from the battery is supplied to the conductors under test in the form of an alternating current, generated by means of an induction coil, marked I in the accompanying drawing, and a buzzer marked B. The resistance R is a fixed non-inductive one, and the dial, as before described, is composed of 100 equal coils connected between the steps, the total dial resistance being the same as that of the fixed resistance. The cable conductor which is broken is joined with its mate at one of the terminals of the set, and two wires of another pair of the same size and length are connected to the set at the terminals of the secondary of the induction coil. Listening in the receiver, the dial lever is turned until silence is reached, or as near silence as is found possible. Then the distance from the point of observation to the break is found by multiplying the total length of the cable under test by the number of ohms between the switch lever and the end, and dividing by 200. In this, as in any capacity test for the location of a break, the wires involved in the test must be open at the distant end.

In both of these articles on testing and fault location, attention has been confined to methods immediately applicable to troubles. There are many modifications of methods based on the same principles as those which have been described, and there are many other methods based on different principles. The Wheatstone bridge and a reasonably sensitive galvanometer offer a variety of possibilities in tests for the resistance of things. Commercial sets on the Wheatstone bridge principle enable resistances to be measured over a range from a few thousandths of an ohm to several thousand ohms, and the insulation of conductors may be tested up to about one megohm with such commercial sets. A more extended study of such testing methods will well repay the labor involved, even if one has no occasion to apply in practice the knowledge gained. Much has been written on the subject, the most voluminous work being that of Kempe. In his work will be found described the methods applicable to deep sea cables. Two simple and useful little books are those of Thomas D. Lockwood, and Herbert Laws Webb. The former is called "The Galvanometer and Its Uses," and the latter "The Testing of Insulated Wires and Cables." In neither are there many calculations involving mathematics other than arithmetic. In fact, practically all tests, except those depending on loss of charge, may be solved by mathematics no higher than algebra.

INTERNATIONAL ELECTRICAL CONGRESS.

The International Electrical Congress will convene at the music hall of the Coliseum, St. Louis, at 9:30 a. m. on Monday, September 12.

It is intended that after the opening ceremonies, the convention will immediately divide into sections, the section halls being on the second floor of the same building. The bureau of information and the offices of the secretary and treasurer will also be in the Coliseum building. On Tuesday, Thursday and Friday, the sections will meet on the second floor of the Coliseum from 9 a. m. to 1 p. m.

The committee of organization of the congress was appointed by the president of the St. Louis Exposition in June, 1903. The committee held its first meeting in August, 1903. In response to invitations to join the congress 1,915 acceptances have been received, of which 1,542 are from North America and 373 from other countries. Over 1,300 certificates of membership have been issued to persons who have already become members by forwarding their subscriptions. The committee on organization has issued, at the suggestion of the section officers, invitations to well-known electrical workers all over the world, asking for papers to be read before the congress. In response to these invitations, about 170 papers have been promised for the congress, and 67 are already in hand.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

765,255—Scribner & McBerty. Service Meter for Telephone Exchanges.

This is a call register or service meter intended to be used in the system devised by Charles E. Scribner and patented September 3, 1901, No. 681,860. The register proper consists of a single spool in an elongated frame extending beyond the end of the core and there carrying the register mechanism and armature, as shown. The magnet has a high winding and a low winding, and in the standard Bell circuit the high winding is connected as a permanent shunt around the cut-off relay, in a path from the test ring of a spring jack to earth, and supplied with current through the cord when a plug is inserted. The low winding is in shunt of the high winding, but this shunt is closed only when the armature of the register is attracted. The windings are so proportioned that when a plug is first inserted the current, which is supplied through the supervisory lamp branch of the cord, *4*, is insufficient to excite the register, but works the cut-off. The operator has a key *k* closing a shunt around the supervisory lamp through another register and an indicating lamp *1*. When this key is closed the current flow through the high winding of the line register is sufficient to pull up its armature. When the latter comes up it closes through the low winding, the two being arranged so that the total ampere-turns is always the same, and thereafter the current through branch *4* is sufficient to hold up the armature.

765,413—J. J. Comer. Selective Signaling Apparatus.

This is a step-by-step-selective party-line scheme, in which the novelty resides in the apparatus employed at the subscribers' stations. The line circuit, spring jack, line signal and cord circuit are standard, a double selecting key being connected in the cord whereby impulses of direct or reversed current can be sent over the metallic line. At each subscriber's station a peculiar polarized relay or circuit closer with two armatures has its fixed coil normally bridged across the line when the hook is down, its field being composed of permanent horse-shoe magnets, and the general arrangement resembling that of a hand magneto generator. The figures herewith are opposite end views of this selector, upon one end of which is mounted a ratchet wheel engaged by a stop pawl *q3* and a stepping pawl actuated through a central shaft *m* by one of the two armatures. These two soft iron armatures lie within the coil, turned upon shaft, and are limited by pins in slots so that they move in opposite directions only. Direct current impulses coming over the line move one armature to step around the ratchet wheel and a selective pin thereon (this being differently located in each station) so that at the station selected the pin will throw over a circuit closing arm 1^4, and then a single current reversal moves the second armature to throw up a notched arm which engages and holds the first arm at that station only. At all other stations the second arm trips the retaining pawls, and all other wheels are set back to zero by retracting springs. At the selected station the two arms close a local battery circuit through a bell.

765,461—W. M. Davis. Selective Signaling System.

This is another selective party line scheme, but as some of our practical friends would phrase it, it is getting down to brass tacks, without any needless mechanism. Mr. Davis puts six stations on one metallic circuit, using each one of the component line wires to signal three of the stations. If we call the two sides of line No. 1 and No. 2, respectively, the invention may be stated thus: A polarized ringer and condenser are placed in a ground tap from No. 1 side at one station; a polarized make-and-break bell operating with plus current, together with an impedance coil, are placed in a ground tap from the same side of line for the second station; an oppositely polarized make-and-break bell with a similar coil are placed in a third ground tap from the same side of line at the third station; an ordinary polarized ringer and condenser are placed in a ground tap from the No. 2 side of line for the fourth station; a polarized make-and-break bell with a coil are placed in a second ground tap from the No. 2 side for the fifth station; and finally an oppositely polarized make-and-break bell with a coil are placed in a third ground tap from the No. 2 side for the sixth station.

Alternating current sent over No. 1 wire to ground rings the bell at No. 1 station, but does not affect Nos 2 and 3 because their coils choke it back. Nos. 2 and 3 can be rung, however, by continuous current of one or the other direction. Alternating current over No. 2 side to ground rings station No. 4, and direct or reversed continuous currents ring Nos. 5 and 6 at will.

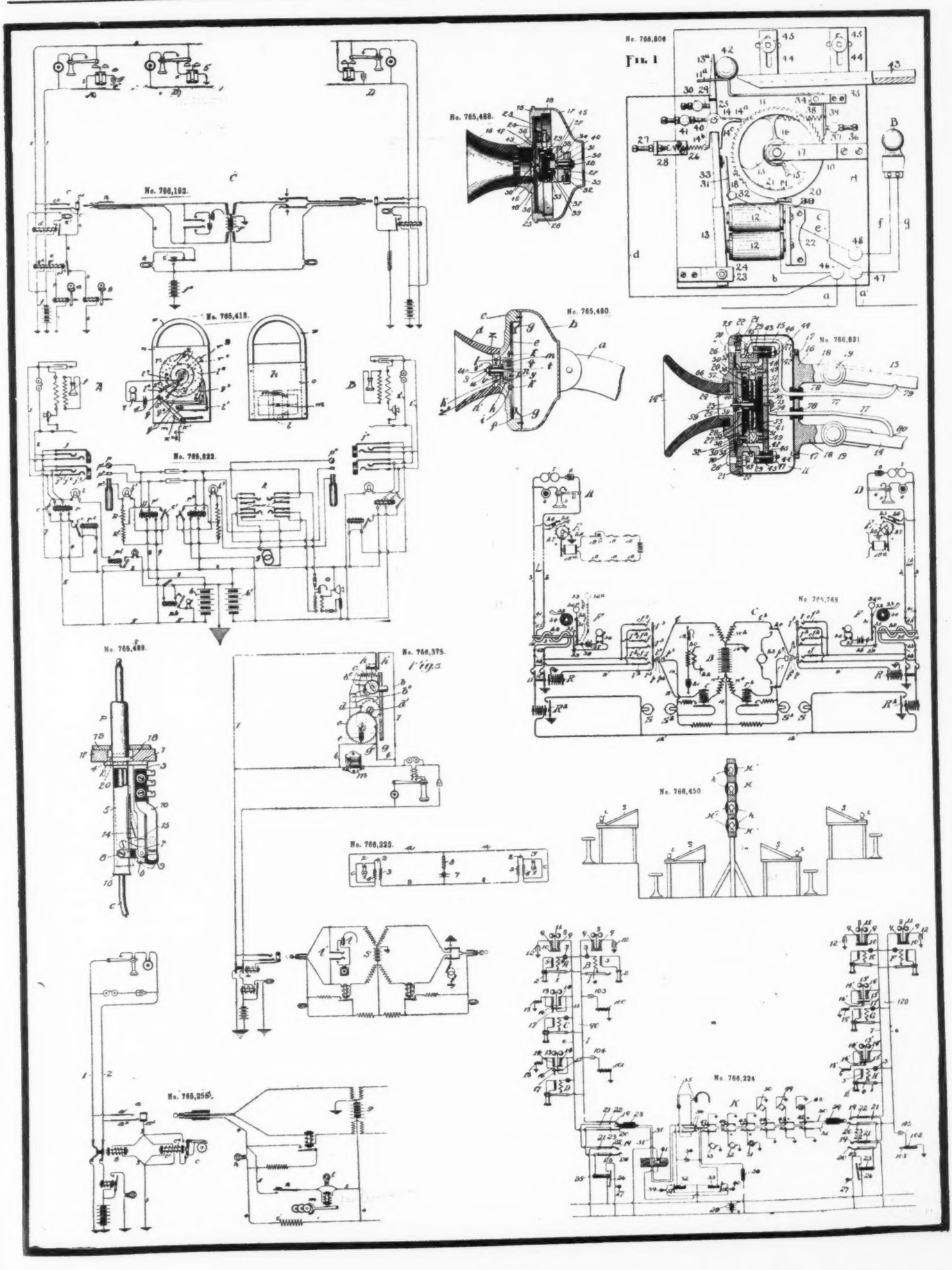
By the term "make-and-break bell" I mean a back contact vibrating bell. These are indicated in the drawing as ordinary biased ringers with back contacts for their armatures.

765,480—R. Hansen. Battery Transmitter.

This is a White solid-back transmitter without any insides. It reminds one of a watch with its works on the outside of the case. In effect, it is a Dean-Kellogg transmitter, turned backwards. The bridge is inside of the mouth-piece supported across the opening in the front plate, the carbon electrode chamber is on the front of the diaphragm, to which one electrode is attached, and the stem for the other electrode comes out through the front or projecting bottom of the pill box on the diaphragm and is secured in the bridge, being insulated therefrom. From a practical standpoint, this form of transmitter looks inferior to either the White or the Dean-Kellogg, and it has the great disadvantage that its adjustment can be tampered with by simply unscrewing the mouthpiece, which many users are childish enough to do.

765,488—W. Kaisling. Telephone Transmitter.

Both this and the preceding patent are assigned to the Stromberg-Carlson Telephone Company of Rochester. This company is becoming exceedingly well fortified in its patent holdings and bids fair to take a leading position in this as it has in respect of commercial standing in the Independent field. And in this lies wisdom, for in a sense patents insure their owners against disturbance. The question has often been asked, of what use are patents commercially? There are two answers. In the first place if you have a good thing you want to keep other people from using it if possible. In


No. 766,192.
No. 765,413.
No. 765,822.
No. 765,488.
No. 765,480.
No. 766,808
Fig. 1
No. 766,821
No. 765,749
No. 765,489.
No. 766,375.
Fig. 3
No. 766,223.
No. 766,450
No. 765,255.
No. 766,224

the second place if you are a manufacturer you must plan ahead, and the better you have covered your field with properly drawn claims the better chance you have of not being choked out by competitors in the inevitable race of improvements. Many large concerns, for both of these reasons, have regular patent departments, and if they write off their patents occasionally, this is on paper only, and has no more significance in fact than the writing off of insurance would have. Insurance may not be an asset, but it is highly necessary just the same, as many a man has realized after he has had a fire.

All of which has nothing to do with Mr. Kaisling's invention, which, however, seems to be well worthy of patent protection and is quite as well designed as might be expected from the inventor's high standing as a mechanical expert. This instrument is a solid back transmitter having its electrode cup on a stud secured in a bridge as usual, but out of the ordinary in this, that it has several fixed electrodes in the shape of insulated discs in the bottom of the cup, without any movable electrode. The resistance is varied by the front plunger (attached to a mica diaphragm the same as the usual front electrode) varying the compression of the granular carbon, and thereby varying the resistance of the paths between the fixed electrodes.

765,489—W. Kaisling. Plug Seat Switch for Telephone Switchboards.

This patent also is assigned to the Stromberg-Carlson Company. It comprises a frame whereby it is secured under the key shelf or operator's table, co-operating leaf springs *10-11-12* screwed to a flange *3* on the frame, and a tube *5* upon which the plug rests with its cord going down through the tube. The upper end of the tube slides in the frame as a guide, and the lower end is pivoted in the forked end of a lever which is itself pivoted between the hangers *7* on the frame. The outer end of the lever carries an insulating button *9*, which moves up and down between the springs to change the circuits. When the plug is lifted the springs come in and force down the button, lifting the tube. When the plug is put back it forces down the tube, and forces the button up between the springs.

Reissue 12,240—A. K. Andriano and H. Herbstritt. Individual Telephone Switch and Lock Out Mechanism for Interconnecting Lines.

The invention in this case relates to intercommunicating systems in which individual wires are used for selecting, and wires common to all the stations for talking. A desk set is presented also. The selecting switch is in the base of the desk set and concentric therewith, contacts being arranged around the margin. A dog normally holds the switch from turning in either direction, a spring tends to return it to zero when released, and a second dog holds it from returning when set in calling. The switch-hook releases the second dog when down, but keeps it in locking position when up.

A circuit closer controls the connection of each local station talking circuit with the common talking line, but is normally held out of action and controlled by a magnet energized after selection over the talking circuit and the ringing circuit.

765,213—R. W. Thompson. Memorandum Attachment for Telephones.

This is a device supported on a desk or wall set by a small clamping arm and comprising a pair of metal plates hinged together and closing like a book, being held flat and opening away from the telephone. When opened inside cards are disclosed containing the telephone numbers most frequently called. When closed the outside of the cover plate is upward and carries a pad for memoranda.

765,635—H. C. Rose. Transmitter.

This is not an electric telephone, but is an interesting novelty nevertheless. It looks like a watch case receiver, and contains nothing but a diaphragm with pointed pins carried by it and extending back through holes in the back of the case. It is intended to be pressed against the skin of a deaf person, and the inventor naively says that when the pins are vibrated "corresponding sensations are produced on the skin." This appears to realize the old saw about talking a hole through people.

765,768—W. W. Dean. Auxiliary Apparatus for Telephone Systems.

A great deal of attention has been attracted of late by the various schemes proposed from time to time whereby telephone circuits, which are idle a large part of the time, may be used for other purposes. One of the inventors who has pursued this subject logically with a view to developing the possibilities is W. W. Dean, and this alone would tend to excite curiosity, inasmuch as Mr. Dean's name stands not only for originality, but for practical accomplishment. In the present case fire alarm or other telegraph apparatus is described, a make-and-break wheel at an outlying point having two normally open pens attached to opposite sides of the telephone line, and itself being grounded. The wheel is controlled by manual pulls, as usual, or by a local thermostat circuit, which may be combined with a sprinkler system. At central (and herein lies the main point of the invention) branches of the line are taken off at the distributing frame, and suitable receiving apparatus connected thereto. It will be observed that normally there is no distributing connection on the line, and when an alarm is sent in the two sides of line are at the same potential. In order to prevent the operation of the line signal on the switchboard the telegraph receiver has its two windings parallel and included serially in the line wires. Even if the switchboard lamps should take current, however, they would flash intermittently, and the operators would disregard such flashing.

The claims are very broad, being directed to the connection of auxiliary apparatus to a telephone line at the distributing frame.

765,822—J. P. Downs. Telephone Exchange System.

This is an invention of some interest, relating to the supervisory and cut-off circuits of a common battery exchange system. The diagram shows two subscribers' stations, *A* and *B*, deriving current from the main batteries *b* and *b'* at central. The cut-off relay *r* has the battery connection interposed between its two windings, and the supervisory relays *r' r3* are arranged in the same manner.

The main feature of the invention is the provision of a resistance divided into two parts, *R* and *R'*, connected in the battery wire *9* in shunt of the supervisory lamp *1'* when the latter is cut in. Either branch, the resistance branch or the lamp branch, will pass current enough to energize the cut-off relay *r*, and the potential on the jack rings is kept approximately constant. When the lamp is cut out by the attraction of the armature of the supervisory relay *r'* the resistance coil *R'* is at the same time shunted so that the resistance of branch *9* is constant or nearly so. This is due to the fact that when the lamp and both resistances *R* and *R'* are in parallel the total resistance is approximately one-half of their separate resistances, so if the branch through the lamp were broken and the whole coil *R-R'* left in, this total would be doubled. By cutting the remaining resistance in two, however, the parity is maintained. It is to be noted that no matter what happens to the supervisory lamp, the cut-off relay always gets current. This is better than putting a shunt around the lamp to control it, and depending on current through the lamp when it is included in circuit. The lamp might burn out, in which case the cut-off would be inoperative at once.

766,155—D. H. Wilson. Telephone Repeater.

This is simply a double ended receiver with two transmitters set against its diaphragms, one at each end, each end of the receiver being provided with a primary and secondary winding. The primary windings with a battery are included in a local circuit with both transmitters. The secondary windings are included in the opposite sides of a metallic circuit between two stations. Speech waves over the metallic circuit in either direction affect the receiver magnet poles, act on both transmitters, and so through the local circuit and induction coils react on the receivers and the line. Time elements and lag, etc., are entirely disregarded in this lay-out, apparently. It looks as if a good, strong musical note in front of any transmitter in the line would cause a general "howling."

766,192—J. L. McQuarrie. Measured Service System for Party Line.

This is a meter scheme whereby each subscriber on a party line will have his calls registered separately. A differential magnet *e* has its windings included in the two sides of line at central, both being grounded, and only one containing battery *f*. When one subscriber calls this relay is energized, when the other calls it is not. When energized it cuts in one registered *a* in the local circuit *6*, and when it remains deenergized it cuts in the other register *b*. In order to produce this selective action, one subscriber *A* bridges the line when he calls, but unbalances it for battery current because there is a permanent ground on at *4* in the other station. One winding of the relay *e* therefore gets more current than the other, and the armature is attracted to cut in register *a*. When the other subscriber calls he cuts off the ground at station *B*, and the line being balanced the armature of relay *e* remains back, cutting in register *b*. The operator works whichever register is in by means of key *i*.

766,223—W. M. Davis. Telephone System.

This is a new talking circuit belonging to the Stromberg-Carlson Company, designed in the beginning of 1903. The primary and secondary *3* and *4* of the subscriber's induction coil are included in series for battery current, with the transmitter *2*. The receiver *1* is in a shunt around the secondary. By this arrangement in a common battery system only a small portion of the battery current over the line passes through the receiver, while the latter takes the voice currents from both home and distant stations.

766,224—W. M. Davis. Selective Signaling System.

This is another variety of the selective system digested above. The objects of the present invention are to provide for balancing the line with a less number of stations on one side than the other, and also to prevent continuous current leakage. The general arrangement of the station is the same as described in the other case, condensers and impedance coils being used at the different stations, and dummy branches to ground being put on to even up, these containing coils and condensers to balance.

766,225—E. W. Day. Apparatus for Transmitting Messages by Telephone.

This is a scheme whose principal merit is in its novelty. Most of us have heard a human zylophone composed of a row of people, each one of whom is charged with the utterance of one single note or tone and no other. The performer plays a tune on these people by touching one and then another as a signal to each to emit his little note. The scheme in the present case is very similar. A series of so-called individual phonograms is provided, each being a phonographic record of one word of one syllable, together with controlling devices so arranged that the operator can set them off in any order he pleases. Thus if he had a set of record containing such words as beer, you, participate, ever, never and do, the question of whether you never participate or ever indulge could be answered merely by touching the proper keys in the proper order. Telephone receivers and transmitters are employed to transmit and reproduce sounds.

766,241—R. W. Goeb. Telephone Locking Mechanism.

This is another one of the series of patents assigned to the Controller Company of America. The scheme in all of these is to lock down the receiver hook or to prevent the receiver from being removed therefrom. In the present case the receiver is locked in by a rotatable spider with co-operating mechanism, as described in patent No. 739,114, which was digested in these columns October 1, 1903. The spider lock can be released either by the deposit of a coin or by a magnet controlled from central. Mechanism is also introduced for returning the coin, this being controlled by a magnet. The main feature of invention in the case lies in the provision of switching means controlled by the ordinary ringer magnet of the telephone to work the unlocking mechanism. Thus when central makes a call she automatically unlocks the receiver hook. The ringer magnet is also used to close the coin-return circuit.

766,354—C. C. Hughes. Telephone Box.

This is a telephone set having its backboard fixed to the wall, and provided with clips for holding the set, the circuits being completed through the clips when the box is in place.

766,355—C. Hulsmeyer. Telephonegram Apparatus.

This is an apparatus for printing a record of sounds on a strip of sensitized paper, the paper then being run along between a source of light and a selenium cell, the changes in resistance thus produced causing a reproduction of the sound in a receiver.

766,375—J. L. McQuarrie. Service Meter for Telephone Exchanges.

In a system equipped with this meter the subscriber buys a certain number of calls. His register has to be actuated each time he calls, and after the number is completed a signal is brought into the line which notifies the operator when next he calls. In the figure a buzzer *m* is the signal, normally shunted by wire *7*, the shunt being broken after a predetermined number has been made.

766,450—I. Kitsee. Telephone Exchange System.

Dr. Kitsee here presents some figures strikingly suggestive of a village school or a bucket-shop. Signal lamps *H'* are set in the thickness of the main annunciator board and the line jacks are stratified slabs on the desks *s*. The plugs are big enough to have lamps apparently of eight candle power set in them. Connections are made through the various strata, and among the other wonderful things the receivers at the substation are apparently operated on a wireless basis, as they are shown floating in the air entirely disconnected.

766,451—I. Kitsee. Telephonic Transmission.

A metallic circuit divided up into sections by condensers, and with bridges containing impedance. Just how any improvement is produced is not stated.

766,503—I. Kitsee. Telephonic Transmission.

Substantially the same thing as in the last patent, except that each section of the line is a closed local circuit with two coils in it, all the coils being shunted by condensers in the line.

766,806—B. Brooks and H. F. Metcalf. Individual Selective System.

This is a sort of football game applied to a step by step selective device. A ball *42* is kicked up at each impulse of the subscriber's selector, onto the runway *43*, and if the im-

pulses come fast enough it will be kept kicked up. During a break, however, it runs down and forces down the arm *11*, pushing out the stop pawl *30*. Contact for the local bell is made between spring *31* and point *18*, differently located on each instrument.

766,821—A. Gamache. Telephone Transmitter.

A transmitter of Canadian origin, this inventor residing at East Clifton, Quebec, Canada. The intermediate electrode *54* works in the granular material between the outer electrodes *37* and *50*. A double barrelled arm is shown.

766,929—F. H. Chamberlain and R. H. Coleman. Telephone Attachment.

A directory for a desk set comprising an arm clamped on the standard, and a cylindrical containing case with a slot along one side through which you can pull out the directory like a tape measure. When you let go it rolls up inside the case automatically.

766,945—H. I. Hawxhurst. Selective Telephone Call Mechanism.

A step by step selector, having the usual step by step device with a circuit closer differently located at each station, a line magnet stepping it around and locking it after each step together with a so-called "momentum wheel" which is kept pushed back during stepping like the ball in the case noticed above. When the wheel comes to rest it throws out the detent.

767,033—R. M. Beard. Telephone Central Exchange Installment.

This is a secrecy scheme, and its author is evidently afflicted with fears of totality, judging from the title. He intends his invention for use in banking houses, etc., and perhaps he is presenting it by installments, or perhaps this is merely the attorney's idea of good English.

The individual line signal is connected through the jack cut-off as usual. Series multiples are employed. On the operator's table the keys for each pair of cords are arranged in a group of one two-way listening key and two ringing keys, so that when all are in their normal position the cords are connected through, but when either of the keys is used its cord is disconnected and it is put to generator. The listening key also breaks the plugs apart, the same as a ringing key.

767,284—W. M. Kelley and G. E. Truxell. Central Energy System.

Power wires are run out to all the stations in addition to the line wires. This is like Mme. Melba's reasons for not getting a divorce. There were seven, the first being that she had no husband, and the others needed no consideration. The separate power wires in this case are quite enough, but in addition the inventors mount a sort of double trough on their switchhook, with mercury in it, and twelve contacts which are more or less connected as the mercury washes to and fro.

767,356—J. W. Schmidt. Telephone Order Desk.

This is an order desk having an elaborate ratchet feed mechanism and a handle which can be pumped up and down to pull out paper on the telephone desk.

USES OF THE TELEPHONE.

We have become so accustomed to including the telephone among the comforts of home that it is doubtful now if we really appreciate all of its many and varied advantages. The telephone is more than an instrument over which to talk to the butcher and baker—it is a medium sometimes for furthering treason and stratagem and acquiring spoils.

Does a young woman receive a call from a masculine friend who bores her to extinction and she be ingenious, she gives her brother or sister, or, as legal documents say, her next friend, a look of entreaty, and directly he disappears, and almost immediately the telephone rings and the young woman is summoned, and comes back to say that her grandmother is ill in the next block and she must go to her at once. When the visitor has departed the rescued one thanks her rescuer warmly and adds a blessing for the telephone itself, such is the intensity of her gratitude.

Sometimes the telephone saves the self-respect of young men who have quarreled with their sweethearts. To go back to pay a visit after he has flung himself out of a house declaring he will never darken its doors again, would not be consistent with any masculine's dignity, but it cannot be considered as a confession that he was in error in his premises if he call up the young woman who has insulted him by telephone the next day but one, and asks her in a voice made carefully frigid any one of the following questions:

Have I any books of yours which you wish me to return?

How shall I send your letters back, by mail or by messenger?

Will it incommode you at all if I send to your house tonight for my copy of Omar?

Did I injure the glass in your front door when I shut it night before last? I am afraid I used almost too much emphasis.

Do you still wish me to take you to the theater, or shall I send you the tickets and allow you to select your own escort?

If the young woman replies with proper tact, diplomatic relations will be resumed in a shorter time than it takes to write all this, for it is ten to one the young man is in the drug store on the nearest corner, although his voice sounds as far away as the polar icebergs.

It is a mighty good thing, by the way, that that invention has never been perfected that was once talked of and which was designed to permit the users of telephones to see each other while conversing, for not only would this be inconvenient to the men who declare they are in their offices, when in reality they are at the club indulging in a "quiet little game of draw," but also would it be exceedingly disagreeable to the young woman who holds conversations over the wire with the young man who admires her most, with her golden hair hanging down her back and wearing a bathrobe, for such things are.

Imagine the feelings of a youth, for instance, who expects to take his sweetheart to dinner at 7:30 o'clock, when she is clad in jewels and fine raiment, calling her up an hour before this time, only to behold his fair inamorata with an aureole of curl papers around her head and a dab of powder on her precious little nose! Perish the thought!

This, of course, is purely a picture of the fancy, for, as every one knows, curl papers are as much out of date as crinoline and poke bonnets, and powder went out of style with the fashion of wearing the hair in queues, but just for argument's sake try to imagine such a contretemps. Would it not break up many a promising affair of the heart?

To return to our mutton, as it were, the telephone is a most valuable invention—one of the greatest ever given to the world. It reunites loving hearts and furnishes reasons for jealousy to lovers who need prodding and excuses to those who wish to get rid of bores—but it is great enough as it is, and we do not want any improvements with it in the line of machines to see around corners. We have had troubles enough already, and too much knowledge doesn't add to anyone's happiness.

At last reports there were 5,265 Independent farmer or rural telephone lines in the United States.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

Automatic Telephony—ABBOTT.—*Cent per Cent, July.*

GENERAL TELEPHONE ENGINEERING.

Greater New York has about 100,000 telephones; 1,000,000 messages are transmitted over these lines each business day; 1,800 employes and $4,000 per day are required to furnish the service. Telephone service in other towns is proportional to the number of telephones, and it is estimated that in the United States in 1903 there were over 5,000,000,000 messages sent and 80,000 persons employed, absorbing $35,000,000 in wages. Most of this telephone service is given by means of manual switchboards having an elaborate system of signals controlled by the subscribers and by the manipulations of the operators. It has been found of commercial advantage to increase the investment in equipment from time to time in order to accomplish even slight improvements in the service. From time to time attempts have been made to devise means for placing two subscribers in communication without the intervention of an operator; because of the character of the systems, or of the former monopolistic control of the telephone business, marked progress in automatic design and operation has been delayed until recently. Interest in automatic telephony is increasing, however, and this is evidenced by the installation of a number of large equipments of that type and by the invention of new systems approaching in some details nearer to the real solution of the problem. The author describes a semi-automatic telephone system and says that it is one of the most ingenious and promising. Having cited large installation expense, delay in completing connections, probability of error, and lack of secrecy, as four objections to the system, Mr. Abbott implies that the system that he describes is better in these particulars. In a degree the details of the system in question are described, and it may not be said that all of the concluding comment is in the direction of unqualified endorsement of automatic telephones.

Alternating Current Propagation in Telephone Cables—FLEMING.—*Transactions of the Physical Society.*

A mathematical consideration of the effects of capacity and inductance in securing a distortionless propagation of waves. The author has set up an arrangement of mechanical parts involving a shaft and eccentric wheels. The amount in which each wheel is out of center with the shaft can be varied, and when thus out of center the angle of the line joining the wheel and shaft centers in a given disc can be varied with reference to such a line in other discs. A string attaches the circumference of each disc to a metal block sliding on a steel wire. This method of setting up a mechanical analogy assists in demonstrating the somewhat involved construction of a distortionless circuit. The author points out again the immense commercial contribution which will be made by any one who can produce a cable for submarine purposes having a capacity not much above 3/10 microfarads per knot with an inductance of 300 or 400 henries per knot.

Elkhart, Indiana, Exchange.—Telephone Journal, July 23.

A short description of the system of the Home Telephone Company.

Santa Barbara, California, Exchange.—Telephone Journal, July 16.

A short description, with an illustration, of the plant of the Home Telephone Company.

Brooklyn Police Telephone Headquarters.—Electrical Review, Aug. 6.

The Brooklyn police telephone system is a most efficient and carefully managed one. It is not usual for such systems to be kept up to date, but this is an instance which is an exception. The system comprises about 600 miles of wire and 480 telephones, of which 390 are in connection with the police signal box system, and the balance in the precinct stations. From the police boxes it is possible to call for the patrol wagon, or for the ambulance, to give an alarm of fire or to talk by telephone. The telegraph calls may be followed by a telephone conversation. The routine of the operation of the station is instructive, as an example of the use of the telephone in a business in which errors must be eliminated with great thoroughness.

Telephone Engineering—KELSEY.—*Electrical Review, July. 30.*

The eighth article of a series. Common battery systems described in previous issues of the series have been those used by the Bell company, and are uniform in the general use of three conductors or stands in the cord and line circuits. Two of these three conductors are necessary for two sides of the line, and the third is useful in controlling the conditions of the signals. As practically the whole array of circuits on this plan was covered by Bell patents when Independent telephony came into being, and because it was of advantage to use as few conductors as possible in the line and cord circuits of multiple boards, the inventions of the Independent manufacturing interests have been largely along the line of two-wire and two-strand systems. Something of the saving by omitting the third strand is pointed out in this article. The particular circuit described is that using two different batteries, the two halves of the cord circuit being energized from these separate sources. This arrangement avoids the infringement of patents covering the single source of current, and in this lies the distinction between a centralized battery system and a common battery system. The author gives credit for the circuit under description to F. W. Dunbar; it is believed that there is some error in this as we understand that the invention was made by a patent issued to Kempster B. Miller for the very circuit described.

Chicago's Automatic Telephone Exchange.—Western Electrician, Aug. 13.

The capacity of the present automatic equipment is 10,000 lines, and 8,000 of them are in operation. All of these telephones are in the downtown business center of the city, and it is probable that before extending the system outside of this area, several times the present equipment will be required. There are sixty 200-pair cables leading into the central office from the tunnels under the streets. The distributing frame with its full equipment of arresters receives these cables and passes the lines on the automatic mechanism on two floors of the building. The Chicago system is that in which the relays of the switches are in series with the line. Three line drawings illustrate the circuits and the mechanism of the switches. Six photographs illustrate the arrangement of the office, and of the cables in the tunnel, and two floor plans and a wire chart assist in describing the conductor distribution.

McKeesport, Pennsylvania, Syaye—LANE.—*Telephone Journal, Aug. 13.*

A description of the Pittsburg & Allegheny Telephone Company's system in that city.

Telephone Engineering—KELSEY.—*Electrical Review, Aug. 13.*

The ninth article of a series, and continues the description of two strand cord circuits. The phase considered is that of the cord circuit having two batteries, two conductors, two retardation coils, but no repeating coil.

Telephone Engineering: an Inviting Field for Young Men.—Western Telephone Journal, August.

The basis of a telephone engineer's training involves mathematics, physics and chemistry, and he must be familiar with the details of systems of application as they exist and appear. It is beginning to be more generally understood that it is important to have available plenty of trained and competent assistants.

Banquet to Dr. Elisha Gray in 1878.—Telephony, August.

On November 15, 1878, three hundred neighbors and friends of Dr. Gray tendered him a complimentary banquet, of which the tenor was congratulation to him on account of his invention of the telephone. The toasts, speeches and poetical contributions are reproduced at length.

On the Differential Telephone—HO.—*Physical Review, August.*

Commenting upon the work of Messrs. Duane and Lory, which reported results of extreme accuracy in the use of the differential telephone in the measurement of inductance, this Japanese author properly claims credit for early announcement of the advantage of the method, and asserts that the series manner of connecting the two windings of the receiver is better than the parallel method used by the investigators noted above. In their paper before the St. Louis meeting of the Association for the Advancement of Science, these investigators noted the difficulty of making a differential telephone, in which the two coils would turn out to be exactly equal in their inductance, resistance, and magnetic effect upon the diaphragm. Mr. Ho says that these difficulties are found to disappear when the two wires are wound side by side, and as close together as possible, from beginning to end. When the coils are so wound, their inductances are completely balanced by the mutual inductance, and they act as non-inductive resistances. It is possible to compare capacities with great accuracy by the use of this instrument, the operation, as in all its uses, being to arrange the changeable elements until such a balance is reached as will cause no sound in the telephone. In a reported instance, with a voltage of 500, capacities of less than one-millionth of a microfarad were measured. It was even found possible to measure a conductance and a capacity in parallel at the same time.

Composite Circuits—RUGH.—*Telephone Magazine, August.*

A considerable extra revenue can be secured by arranging toll lines for simultaneous telephony and telegraphy, as telegraph service may be sold at a considerable profit, and the equipment is not expensive. In Europe such a method is used on railway lines. It is expected that composite work will extend in this country.

The Evolution of the Telephone—MCBRAYNE.—*New England Magazine, July.*

This year marks the end of a quarter of a century of actual speech transmission between towns. The New England states contributed much to the early history of telephone development, an interesting phase being that at Bridgeport, Connecticut, where a social telegraph company formed a nucleus, to which the telephone possibility being added, an early and successful telephone exchange resulted.

Wireless Telephony—MARSHALL.—*Electrical Age, July.*

In an article on notable electrical exhibits at the St. Louis Exposition, Mr. Marshall illustrates and describes two forms of wireless telephony, as well as other telephone exhibits. One of them is the Hutchinson system, in which one carries a telephone about and hears sounds. The other is the radiophone exhibit, whereby one talks over a beam of light.

Electrical Resistance and Measurements—HARDIN.—*Telephone Journal, August 20.*

Resistance is defined, and the derivation and dimensions of the four units of resistance are treated in some detail. Resistance may be measured by means of Wheatstone bridge methods, by fall of potential methods, and by current measuring methods as in determining insulation resistances which are very high. A voltmeter of high resistance shunted by a known resistance considerably lower, is a convenient means of making such resistance measurements, and a formula and drawing make the matter clear.

Wireless Telephony.—L'Eletricitta, July 23.

Senor Garcia, a Spanish investigator, has made certain rather notable experiments in transmitting speech by Hertzian waves. He has inserted a telephone transmitter in the local circuit of the induction coil ordinarily used in wireless telegraphy, and has omitted the usual circuit breaking device from this circuit. With a proper local current the diaphragm vibrations are copied in the spark which takes place at the gap across the ends of the secondary coil. Grounding one side of the gap and connecting the other to an antenna, sounds can be transmitted, which, when received at another station by means of another antenna and a self-releasing coherer, can be heard in an associated telephone receiver. It cannot be said that the method has advanced far enough to be practical, as articulation is not satisfactory.

The Modern Telephone System—GRACE.—*Electric Club Journal, July.*

A well illustrated article of the scope indicated by its title, being a paper read before The Electric Club, an organization largely composed of technical men associated with the Westinghouse interests, Pittsburg.

Resume of Experience in Wireless Telephony—MARJORANA.—*L'Elettricista, July 15.*

A discussion of the methods which are possible or seem to be possible in transmitting speech by Hertzian waves. The article points out the advantages and disadvantages of each of several means. As the production of Hertzian oscillations grouped at a frequency above the limit of human audition is necessary, some of the methods of producing such streams of waves are discussed. The article closes with a statement of the things upon which success depends.

Novel Telephone Journal.

The new association of telephone subscribers in Paris has for its object an organized fight against the defective telephone service furnished by the French telegraph administration; and in order that the grievances of the subscribers may be made public, an official monthly journal has been started. The first issue makes the expected charges against the service, and it would seem that there must be some cause for their bitter complaints.

OPERATING.

The Peg Count in Central Office Operation—O'BRIEN.—*Telephone Journal, July 30.*

The third article of a series. Character of service depends on proper distribution of the operating force. Just what to do in distributing the force is only to be known by a careful study of what has happened before. The author gives a typical load curve for a central office handling 10,000 originating calls per day. This is of the usual form, but shows a remarkably large evening traffic. In order to care for the heaviest load, it is usual to arrange the hours of the operators so that the larger force will be present at the time of the larger amount of work. Efficient character of service comes from an intelligent arrangement of the hours. It is found to be of advantage to plot curves showing the changes in the rate of growth of the different classes of lines in each office, and changes that occur in the calling rates of each class. When such data is at hand, planning for future needs is a definite and satisfactory task.

Preaching by Telephone.—The World To-day, August.

Telephones were installed in the Samaritan Hospital, Philadelphia, for the particular purpose of hearing the sermon and other parts of a church service. The music and the speech were transmitted faithfully, to the great satisfaction of the patients.

Relation of Traffic to Efficient Service—KNOWLTON.—*Electrical World and Engineer, August 13.*

The study of traffic is one of the most important phases of the work of securing operating economy. Efficiency of service is a direct function of the way the traffic is handled, and the character and training of the operators in a manual system have more bearing on the service than has the character of the equipment. The usual method of taking the history of the business is to make counts of originating calls at all the offices of a system during one entire day each month. It is important that operators be guarded against both overload and underload, as it has been demonstrated by experience that the character of the service reaches its highest point of efficiency when the operators are given enough to do to fully occupy their time. Experience has also shown that "team work"—the assistance of one operator by others beside her—evens up the load on the positions in a striking manner. The "joker" switchboard, or service observing equipment, makes possible observations and tests of service which are absolutely necessary in testing the quality of the product. The author inserts three traffic curves which well repay study, and also gives the code to be used on Morse circuits in passing information concerning long distance calls.

Subway Construction—CRAIG.—*Telephony, August.*

LINES AND LINE CONSTRUCTION.

Subway construction is no longer an experiment, and its use has advanced from a necessity in large cities to a matter of economy in the smaller cities and towns. The amount of subway to be used requires first consideration, and is best decided by considering the size of the city, its character of construction, and the distribution of the population. Large scale maps having been secured, the records of the city and of other companies using the streets should be consulted. The former are usually incorrect, although one would expect otherwise. Nine feet from the curb, or less, is a good location for the trench. Within four feet from the curb the ground is usually free from other pipes, thus clearing the catch basins at street corners. In residence districts ducts can be laid sometimes in parkways. The number of ducts required by the city for its own use, and a very liberal allowance beyond even ultimate needs should be considered. Manholes are to be located at junction points at corners and angles in the line, and on straight lines an average of 400 feet apart.

Economical Features of Austin, Minnesota, Telephone Plant—STANTON.—*Electrical World and Engineer, August 20.*

The distinguishing feature of this system is that the amount of open bare wire is zero, and the amount of insulated open wire is relatively very small. It has been the attempt of the designer to serve all the subscribers by means of lines carried almost wholly in lead covered cables. One of the former objections to such a method was that, in order to provide lines for all the subscribers and for a reasonable growth, a very large amount of dead cable wire was sacrificed. This has been estimated to be from 25 to 50 per cent. In the case in question the service wires average 147 feet long. All other parts of their lines are in cable.

In five drawings the author shows one wrong and four right ways of making wire joints of various kinds. The requirements of each kind are described and the resistances of such joints after use are recorded from experience. Aluminum wire receives what amounts to endorsement, but the soldering of joints in telephone lines is considered not to be necessary.

Telephone Exchange Construction—NATE.—*Sound Waves, August.*

The principal cities and towns of the United States now have Independent telephone service. This development is most dense inland, and future growth will develop the border states. Because the lines reach the rural districts so generally it is not unusual to find a city of 500 inhabitants with an exchange serving 200 subscribers. As assistance in estimating the cost of small exchanges, general specifications and cost estimates are given. The figures show costs of $27 per subscriber upward.

Telephone Engineering—DOMMERQUE.—*American Electrician, August.*

The cost of the aerial cable lines is frequently expressed in dollars per mile. A mile of uniform cable line is rarely ever found. The effect of this portion of the series is to enable one to estimate costs with a greater accuracy than is usual. In estimating the lengths of cable and messenger wire to support it 3 per cent should be added to the cable and 4 per cent to the messenger measurements to cover sag, losses, splices, wraps, etc. It is ordinarily convenient to get prices on materials, but convenient costs of the different items of labor are not always accessible. The author gives some items and they should be helpful. Costs of splicing are given in terms of cents per foot length of the cable spliced.

Telephone Maps—ELGES.—*Telephone Journal, July 16.*

Maps are of great importance in any engineering undertaking which has to do with a considerable out-of-door area. In the planning, building, operation and maintenance of telephone systems, maps are of very great importance. With the increase in rural development, exchange maps become of greater use than heretofore, and in all such records, they should be drawn to scale, and kept posted. Records of toll lines should be complete, so far as possible, in a map record, as a picture of a thing is ordinarily more immediately understood than a word description of it.

Telephone Protective Apparatus—COAR.—*World and Engineer, July 30.*

The story of the development of protective apparatus, beginning with the familiar saw-tooth arrester used in the early telephone and telegraph instruments, leading through the development of carbon block gap protectors, the addition of fuses, and the introduction of devices operating because of internal heat. The principal types of the protectors of to-day are illustrated, and the original requirements of protector design are reproduced.

A Toll Testing Set—HIGGINS.—*Telephone Journal, August 13.*

A description of a wire chief's equipment designed by the author, particularly for testing toll lines. Two photographs and a drawing illustrate the article.

Concerning Telephone Lines—MCMEEN.—*Telephony, August.*

The fourth article of a series, and describes the methods of making insulation resistance tests by reflecting galvanometer and voltmeter, and capacity tests by galvanometer.

Installation of Telephone Cables—MINHINNICK.—*Telephone Journal, August 20.*

Telephone cables are a product of marvelous perfection and delicacy. This perfection has been secured at the cost of unremitting care in manufacture. Such cables are subject to injury and should be handled during transportation so that the sheath may not be jammed and flattened. Under no circumstances should a cable be left unguarded with its sheath exposed; nor should a reel of cable be put into service without having its conductors tested for freedom from faults of all kinds. Fortunately those tests which are necessary to know that the cable is in generally good condition, are simple, and can be made by means of a battery and a telephone receiver. The article describes the tests in detail. When the tests are completed the ends of the cable conductors, which have been exposed during its progress, should be cut off and the end of the cable sealed up by soldering in a lead cap.

Telephone Right-of-Way.—Electrical Review, London, July 15.

Under the title "Wayleaves for Telephones," the right-of-way matter is interestingly treated.

Multiple Cable Distribution—TYLER.—*Telephone Journal, August 6.*

In a telephone system the wire plant is the part needing the most careful consideration and best judgment in view of the particular conditions of the territory to be served. What part of the system should be underground, what part in aerial cable, and what part in open wire, constitute important fundamental elements; but the distribution of the lines from the cables may be done in many ways. Multiple cable distribution is a method of line construction in which the cable pairs of a system are available at more than one point; the object of using such a system of distribution is to provide for the constant and unforeseeable changes in the location of substations, and for the inevitable errors in estimating growth. Ordinarily it is sufficient to say that errors can be guarded against; in making the development of a telephone system, however, the best that can be done in the sparsely developed regions is to make a fair assumption as to where the various densities of development will occur, and at the best this assumption can only be generally correct. It will vary in minor ways, even if the broad suppositions prove to be accurate. Multiple cable distribution provides a flexibility which offsets these inaccuracies of assumption, and that system of multiple distribution is best which requires the smallest number of cable wires to serve a constantly increasing number of subscribers. Something of all this is drawn out in the article in question. The character and usefulness of the "overlap" method of multiple distribution are treated by definition and example. The evidence is submitted that twisted pair drop wires are objectionable in long stretches, because in windy weather the friction of one conductor upon the other impairs the insulation, and necessitates too frequent a renewal of those conductors.

Multiple Cable Distribution—TYLER.—*Telephone Journal, August 20.*

The second article of a series. Another method of distributing cable conductors is called "block" distribution. It is applicable to aerial and underground cables. As described by this author it contemplates the use of a distributing pole in each block of the territory using that method, distributing the pairs to the subscribers' stations directly from the pole. As the open wire with such a method is limited to a short length per line, insulated wires can be used and difficulties from foliage are practically avoided. As the great value of multiple cable distribution is its flexibility, the recorded details must be full and concise so that the system can be used in a way to secure this flexibility. The author gives examples of good forms of records of such circuits, covering the name and location of the subscriber, the names and particulars of the district, cable, line order, directory designation, and the pair of which the record treats. A distribution record also is important to show the points at which a cable or a part of a cable appears as available conductors.

Exchange Circuits—PARKER.—*Telephone Journal, July 30.*

EQUIPMENT.

One of the most important rules to be observed in cabling main and intermediate distributing frames, and in running jumpers in them, is that the color of the conductors be uniform in their meaning throughout the system. The exercise of systematic care in this regard obviates the inevitable confusion which would otherwise arise. When new jumpers are run the old ones must be taken out. The article contains a statement of the color scheme which has been devised for use in all of the cables in a central office. It is interesting to note that this color scheme, which originated with the Bell company, has been adopted quite generally by Independent manufacturers. This is an instance wherein the general good of the public has been served by a consistent uniformity. The article illustrates and describes in detail many of the important features of the circuits in a system having a three-wire line circuit.

Divided Multiple—BEYLAND.—*Sound Waves, August.*

The third of a series under this caption and describes the circuit details of the four-division system. While the experience with divided multiple systems in this country seems hardly to justify a belief in the ultimate success of such a system, the author believes, nevertheless, that the future holds an important work for such a system to do. Greater complications result from the use of a four-division system than if it were of two divisions. The character of these and their relations to each other are fully described with the assistance of five line drawings.

Night Alarms—WEGNER.—*Sound Waves, August.*

A night alarm is an arrangement for announcing to the operator that a signal has been set on the board or a part of it. One of the earliest types was an arrangement of a thin spring and a local contact, so that the shutter in falling closed the local circuit and rung a bell. The bending of these springs caused trouble and efforts have been made to devise arrangements which will remain in reliable operation. The author describes with the assistance of four drawings some arrangements which he has made for improving this part of the system.

When is a Storage Battery Fully Charged?—N. E. L. A. Question Box. Western Electrician, July 23.

Nine answers to this question range from the boiling of the solution to the more accurate matters of voltage and density ceasing to arise, and the explosive point of the liberated gases having been reached. The best practical answer seems to be that "the charge is complete thirty minutes after voltage and specific gravity have ceased to rise." This is correct for the normal charge rate, which should be about one-eighth of an ampere-hour capacity of the battery.

Telephone Storage Battery Records—KNOWLTON.—*Electrical World and Engineer, July 23.*

Because the changes in the operation and condition of a storage battery cannot be seen and appreciated as quickly as in the case of machines, it is necessary that this expensive part of the equipment be watched with great care. This watching must be more than a mere looking at the things at intervals, and is most effectively done by an inspection of the records of the behavior of the battery from time to time. The story which is told by these records ought to prove either that the battery is remaining in good condition, or that it shows the beginning of a phase of its life which must be changed. A form for the daily records is reproduced, and some comment upon its use is added. All of this should be found of value.

Instrument Setting: Protective Devices—WILHELM.—*Telephone Journal, July 23.*

One of a series, carrying further the chapter on drop wires to substations. In the case of a line having an open wire subjected to the possibility of contact with wires carrying heavy currents, protective devices are necessary at the substation, as well as at the central office. This article describes the type of protector which contains fuses, open space cutouts and heat coils, and in which the carbon blocks of the open space cutouts contain fusible metal designed to flow and short-circuit the cutout when it is operated by the establishment of an arc between the blocks.

Storage Batteries, Origin and Development—WALKER.—*Western Electrician, July 30.*

A paper read before the Canadian Electrical Association. In addition to the general interest which storage battery matters have for those engaged in telephony, this paper will be found to give important historical and operating information.

Safety in the Use of Telephones—AYLSWORTH.—*Journal of Electricity, Power and Gas, July.*

A paper before the Pacific Coast Transmission Association, describing the arrangement of apparatus in a telephone to be used on a line carried by the same poles with power circuits of thirty to forty thousand volts.

Strowger Automatic System—LUBBERGER.—*Telephony, August.*

The second article of a series, continuing the description of the Strowger series-relay automatic mechanism. This section explains the grouping of the switches necessary to accomplish the trunking method which is the basis of the modern plan. This series is characterized by the accuracy of the detail, and is not one which can be lightly read, but requires careful study to trace the operations as they are set down in words. Such study, however, is well repaid, because a knowledge of automatic mechanism has come to be essential in telephony.

The Telegraphone.—Electro, June.

A description of Poulson's telegraphone from the phonograph standpoint, and as an attachment for recording an incoming telephone message.

The Latest Form of Radiophone—FASSETT.—*Electrical Age, July.*

Nearly twenty-five years ago Prof. Bell demonstrated that various substances are capable of being so affected by light as to be useful in the receiving station of a telephone system using such a beam as the means of transmission. Not only selenium is sensitive in that it changes its resistance as the intensity of light changes, but other substances are sensitive to light, or to the heat which goes with it, in a way to enable them to reproduce the speech without any electrical features at all at the receiving station. In earlier forms of transmitters it was the practice to impress the speech upon the light beam by vibrating a mirror, making the light diverge or converge, depending on the shape of the surface at a given instant. In the later forms the amount of light in a beam is governed by the amount by which the arc of a lamp is shunted by the resistance of a transmitter. It is interesting to note that such an arc is also a good receiver, giving out sounds corresponding to fluctuations in the current which actuates it.

Instrument Setting: Entrance to Buildings—WILHELM.—*Telephone Journal, August 20.*

Three rules must be observed: 1, the conductors must be three inches apart; 2, the holes into the building must slope upward as they pass inward; 3, the holes must be bushed with insulating material. Porcelain is the best material for bushings, although hard rubber is suitable. The holes must be of a size to make the binding fit tightly. Rubber tape must bind the wire to the outer end of the tube. Five drawings illustrate the work.

Dardeau Intercommunicating System—D'ALTOFF.—*Electro, June.*

An illustrated description of an intercommunicating system in which each station has a set equipped with a dial and means of securing connection with the required station, without the use of a central office. The installation described is principally designed for use in railway work.

Connecticut Telephone Laws.—Telephone Journal, July 23.

FINANCIAL AND ECONOMIC.

Some comment on the laws of Connecticut concerning telephone companies as passed in 1899. Extensions may not be made except upon a finding that public convenience and necessity demand an extension. No new company may establish its system and construct its plant without such a finding, which is to be made by the Superior Court of Connecticut, or a judge thereof. Even with the most narrow restriction of these laws to their exact language, it is manifest that the interests of the public are not served by their existence, and that, however great might be the benefit to the Bell company, it does not follow that this may not be a detriment to the interests of the state.

Long Distance Toll Accounting—NORTON.—*Telephone Journal, July 16.*

The first article of a series. Accurate methods of accounting and operation should exist in order that the settlements between local companies and the trunk line company may be reached with promptness and accuracy. The first requisite for toll accounting is that the details of the calls and conversations be recorded, and to this end the author presents samples of sent and received toll tickets. The rules under which the charges are made and accounted are succinct and inclusive, and taken in connection with such a system of check, reports and balance sheets, will be found to lay the groundwork of a rational toll accounting system.

Long Distance Toll Accounting—NORTON.—*Telephone Journal, July 23.*

The second article of a series, giving further forms for summary of toll accounts, toll bills and error sheets. The matter of prorating income and expense among the participating companies, is explained by example.

Large Independent Telephone Organization.—Finance, August 6.

Independent telephone men of the United States are said to be planning a strong national association which shall solidify the Independent telephone movement. Meetings have been called in various districts. The object is not to consolidate local exchanges or local companies, but to federate for the advantages of more uniform methods and co-operation on matters of uniform interest.

English Telephony.—Telephone Journal, August 6.

In England the desire to secure the advantages of competition has taken another form from that in this country. Municipal exchanges have been established in several of the prominent cities, and there is a tendency toward further development in that direction. It does not seem yet that the experience of these municipal plants is sufficient to convince any one that it is of public advantage to secure service in that way. Whether it is a function of municipal ownership or otherwise, it seems very clear that the equipment and the methods which have been used in the British municipal exchanges, are woefully behind the best modern practice. This is not the result of a general English ignorance of the best ways of doing telephone things, because both the Post Office and the National Telephone Company have quite as good equipment as can be found in the world, and in many ways have very satisfactory features of management and operation.

Telephonic Tendencies—World and Engineer, July 30.

Signs of change are multiplying in the telephone business. This article draws analogies between telephone development and power production and distribution. The central-energy-relay-lamp-signal-multiple switchboard is now standard and can be made in sizes accommodating 15,000 lines or more. It is a question whether the development now under way will not make it unnecessary to increase the ultimate capacity of these boards, and whether there is not likely to grow up a considerable enthusiasm for automatic or partly automatic systems. There are more questions of economy and maintenance now waiting to be settled than there have been at any time in the telephone past. Engineers and traffic managers are getting closer together and things may be done by their co-operation which could be done by neither alone.

Cost and Compensation—JUDSON.—*Telephone Journal, July 30.*

A notable article. As a commercial enterprise the telephone business cannot continue if the income is not greater than the total cost of producing the service. In the effort to develop Independent telephony, some rates have been fixed which were so low as not to leave this margin; and in the effort to place the responsibility, much injustice has been done. It is notable that a definitely accurate knowledge of the cost of producing the service does not exist in the case of all operating companies. Independent success

is not due alone to the quoting of lower rates. Good service and local loyalty have been and are important factors. The cost of making the service is made up of a large number of items, and this author classifies them under six heads: Traffic, maintenance, taxes, depreciation, interest, and general expense. His interest item is intended to cover only guaranteed dividends and interest on bonds. He recommends the maintenance of an emergency fund to replace property destroyed by extraordinary causes. Depreciation rates vary in the various parts of the system. Copper wire and clay conduit are listed at 2 per cent per annum; iron wire and equipment at 10 per cent. A table is submitted showing the analysis of the actual accounts of eight telephone companies, covering all of the items of cost except depreciation and interest. The averages per telephone per annum in these eight cases vary from $10.61 to $15.45. Some notes on the method of determining the probable cost of service include a plea for reasonable use of party lines.

The Telephone in the United States—WEBB.—*Cassier's Magazine, July.*

A comparison of American and English development and character of service. Mr. Webb is inclined to think that measured service methods are largely responsible for the development which has been made in New York, and that government control is responsible for the small development abroad.

Fire Hazard of Telephone Exchanges—BENALLACK.—*The Survey, May.*

An article in an insurance journal, containing a valuable analysis of 334 fires having to do with telephone exchanges. Seventeen per cent resulted in loss to the telephone central office, and 83 per cent resulted in damage on the lines and in the subscribers' premises. These fires were all from electrical causes; twenty-six of them were chargeable to lightning, and 308 to contact with light and power lines. It appears that these contacts occurred wholly in the aerial distribution district, so that such a part of the system as distributes wholly underground is absolutely free from a hazard of this kind. Fire extinguishers, boxes of sand, asbestos blankets, and tarpaulins are valuable things to have on hand in the central office, in the way of fire protection.

American Telephone Success.—Electrician, London, July 15.

At a dinner to the staff of the National Telephone Company, Sir Henry Fowler stated that the telephone in America has reached a high development because the law and the government did not attempt to dwarf the industry, and because the American people are willing to invest funds in the business. Mr. Gaine made comparisons between British and American development, which were quite to the advantage of the latter. Lord Harris is convinced that the best way of developing the telephone service in England would be to free it from government monopoly.

Independent Telephone Investments—DOUGHERTY.—*Finance, August 30.*

Conclusions concerning telephone investments should not be drawn alone from the arithmetical differences between gross income and gross expense for a period of a year or so. A broader view must be taken, including a consideration of the general necessity of telephone service, as well as the special necessity in the region considered, the rates charged for local and toll service, the character of construction and equipment in the property considered, or to be put into a new property, and the probability of increase in the use of the service. Experience has established the fact that exchanges in small towns must be managed by local interests. All the important telephone patents have now expired, and there is no difference between the Bell and Independent companies in being able to secure satisfactory equipment. It is the opinion of the author that no one concern can ever own and satisfactorily operate all the telephones and toll lines necessary to supply the wants of all the people.

WHAT IS THE NATURE OF ELECTRICITY?

What electricity really is, whether it is a form of matter or simply a stress in the ether, is a question upon which scientists are still divided. Albert G. Whitney, in a recent contribution to the Chicago *Daily News,* upholds the theory that electricity is matter, and makes some interesting if not entirely conclusive comments on the subject.

"Electricity," says Mr. Whitney, "has an inclination of gravity of electricity distinct from and independent of the gravity of the earth's mass. How are the last two propositions determined? In the same manner as science has clearly determined that water has an inclination of gravity; that its inclination of gravity is upon the same lines of inclination as all the other constituent elements of the earth's mass, and hence dependent upon the same center of gravity as the others. If electricity were no more than 'a strain,' 'a force,' 'an energy,' the force of gravity could not exist within it, nor would there be manifestations of gravity therein. The appearance of the force of gravity in a metal does not differ from its appearance in a gas. The force of gravity only exists in matter.

"Electricity is made to do work within the earth's mass on its hasty flight therethrough because mankind has learned how to harness the force of gravity within its substance. The gravity of electricity obviously is independent of the earth's gravity, because the substance—electricity—will not combine with or stop an instant in or incline the least fraction of a degree with any of the elements of the earth's mass."

It is further stated that "electricity is an entity of the ether; it manifests the existence of the force of gravity within it; it passes freely from interplanetary space to the earth's mass into interplanetary space again. The hasty passage of electricity through all the known substances of the earth's mass does not afford to mankind, with mankind's present knowledge, sufficient opportunity for an analysis of its substance; but, by reason of its gravity, mankind may know that it is a form of some kind of matter. Electricity, in all respects excepting its clear manifestations of the force of gravity within it, is yet practically an entire stranger to science."

YOUNGEST "HELLO GIRL."

For the past year little Miss Smith, the five-year-old daughter of Mr. and Mrs. Homer Smith, has not only attracted the attention of residents of Prospect, Ohio, but has been the wonder of all the operators along the lines of the Marion County Telephone Company and also of long-distance operators at various points.

Mr. Smith is the manager of the company's business at Prospect and the child about two years ago began learning the operation of the switchboards in the exchange. In a very short time she became as proficient as the average operator, and for the past year she has proved herself capable of handling the boards in any emergency.

During the first year of her work she confined herself to handling the local boards, which have a capacity of 580 subscribers, but at present she attends to long-distance calls and handles the business nicely.

Little Miss Smith has pretty blue eyes and dark brown hair, and is a very attractive child. She celebrated the fifth anniversary of her birth July 22.

Says the Grant County (Kan.) *Republican*: "One of the ranchmen called a friend up in town and had him open a letter and read it to him over the telephone, thereby saving him a ride of over forty miles. This should make it plain that every man in the county that owns a ranch should own a telephone."

Heard on the Party Line

THE TELEPHONE AND CUPID.

According to a humorous sketch in one of the Chicago papers recently, Dan Cupid has found a new friend in the telephone, and so graphically did the writer of the sketch portray the matrimonial chances of the girl at the switchboard that it has caused a run on the telephone company for positions.

The fact of the matter is an unusual number of telephone girls have been married within the past few months. This does not necessarily mean the girls at "central," but includes the girls operating the private switchboards in big stores and offices as well.

A pretty voice will often do more with a man's heart than a pretty face, and a soft answer from the girl at the other end of the wire has sent many a young man seeking its owner, and the marriage license clerk.

Superintendent Hibbard is rather inclined to ridicule the idea of his company having gone into the matrimonial agency business intentionally, but hints that for some reason he has had an unusual number of resignations among his operators, and there are sufficient known cases to prove that the majority are not quitting to engage in the commercial lines, unless housekeeping may be classed as such. The writer knows personally of one family in which three sisters have followed one another into the telephone office and from there to the altar.

TELEPHONE REHEARSAL FURNISHED FUN.

The telephone as a convenience is more a fact every day as its multiplicity of uses gradually increases. Several ladies of White Oak Line No. 1 have added a new use. One evening during the week there was to be a party and these ladies were to furnish music. The afternoon of the evening arrived and no practice had been held, so they came together by telephone, talked it over and finally concluded to practice over the telephone. The one lady started, "The Sunday school man, no man can be truer; he talks for the Lord but votes for the brewer." The other ladies tried to join in, but concluded the key to high, so the first lady slipped back to the organ to get the proper key and started again. Then the time was the trouble, and one concluded they might get W. W. Runkle's pencil with which to mark time or possibly they could hire him cheaper to beat for them. Thus the practice went on until the selection was considered presentable. How it went, off the telephone, has not been reported, but on the telephone it was entertainment maximus.—Lisbon (Ohio) *Herald.*

TELEPHONE INTERLOPERS.

Some amusing tales, says the Ithaca (New York) *Journal,* about Mrs. "Rubberneck" and Mr. "Buttinski" along the rural telephone lines in Tompkins county are being told which would indicate that with the improvement of the times it is now much easier for Mrs. Jones to know all about Mrs. Brown's business than ever before.

The fact that the persons most interested tell these stories on themselves is evidence that no one cares how much "rubbering" is done along the line. It is equally evident, however, that if one person calls up another in the far end of the town many receivers between these two points come down and some times more than two persons join in the conversation.

Here is an incident which occurred a few days ago. One woman while preparing dinner badly cut her finger. She was alone in the house and did not know just what to do. Stepping to the telephone she called up a friend, told her the circumstances and asked for advice. Before the friend could answer someone else piped out, "Bind it up in salt pork." Still another voice advised court plaster and someone else had another remedy to offer.

Another incident took place when two women were telling each other what they were going to have for Sunday dinner. They heard an organ playing somewhere and upon expressing their wonder as to whose organ it was the music stopped and a receiver was heard to click. A baby began to cry and a voice said, "Keep that child still so that I can hear." Another person sneezed and finally the two women decided to stop, as there were too many listening.

A newspaper office recently called up a correspondent to inquire the age of a man who had died. The correspondent did not know but before she could turn away from the telephone to inquire several voices along the line volunteered the information. None agreed in their answers, and a general discussion ensued. Nevertheless the people enjoy their telephones and even though they are obliged to put up with a single line they say they could not get along now without a telephone.

BROOTEN ENJOYS NEW TELEPHONE.

Now the Brooten and Sunburgh telephone line is completed, and a continual ring from early in the morning till late at night is heard, says the Brooten correspondent of the Willman (Minn.) *Gazette.*

Every neighbor has his call—
Twist the crank and that is all.
Mighty nice when work is through
To gossip for an hour or two
With your neighbors, one by one.
Mighty nice—but lots of fun—
When you hear some others, too,
Telling what is not for you.

Every time the signal rings,
To the 'phone each farmer springs,
Shyly grins, and softly takes
Each receiver from its place.
Other people's secrets dear
Pour into their large, red ears.
How they stoop their knees, I swan.
Telephone's lots of fun.

CLEVELAND IN THE HOLE.

When Esther Cleveland was a little girl her father once telephoned to the White House from Chicago and asked Mrs. Cleveland to bring the child to the telephone. Lifting the little one up to the instrument, Mrs. Cleveland watched her expression change from bewilderment to wonder and then to fear. It was surely her father's voice—yet Esther looked at the telephone incredulously. After examining the tiny opening in the receiver the little girl suddenly burst into tears. "Oh, mamma," she cried, "how can we ever get papa out of that hole?"

WHY THE FARMER LAUGHED.

Some linemen were putting up telephone poles in the country when an old farmer gruffly ordered them off his place. The men showed him a paper which gave them leave to put up the poles where they pleased. The farmer went back to his barnyard and proceeded to turn a big bull into the field. The savage beast made after the men and the old farmer seeing them running from the field at full speed, shouted at the top of his voice: "Show *him* your paper! Show *him* your paper!"

Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

TRUTHFUL ❧ FEARLESS ❧ INDEPENDENT

Edited by
H. B. McMEAL and H. E. BABCOCK.

Published by
The TELEPHONY PUBLISHING CO.
301-336 MANHATTAN BUILDING, CHICAGO, ILL.
Telephone: Harrison 2951.

H. B. McMEAL, - - - - - - - - - President
ED J. MOCK, - - - - - - Secretary and Treasurer

European Office: 36 Maiden Lane, Covent Garden, London, W. C.

TERMS OF SUBSCRIPTION:

United States, Canada or Mexico - - - - Per Year, $1.00
Foreign Countries, within the Postal Union - " " 2.00
Single Copy - - - - - - - - - - - - - - 10 Cents

In requesting change of address, always give the name of the post office to which your magazine is sent. Your name cannot be found on our books unless this is done.

TELEPHONY is not returnable from the newsdealer. If you desire to purchase the paper from a dealer it will be to your advantage to notify him that you will want it, in order to insure his having a copy for you. If you wish to receive the paper regularly, please send in your subscription so that we can mail it to you direct.

Change in advertisements intended for a particular issue should reach the Chicago office of TELEPHONY by the 20th of the month preceding publication. New advertisements can be received up to the 25th of the month.

ENTERED AT THE CHICAGO POST OFFICE AS SECOND CLASS MAIL MATTER

COPYRIGHTED 1904—ALL RIGHTS RESERVED.

CHICAGO, SEPTEMBER, 1904.

Table of Contents.

National Convention at St. Louis....171-172
Wireless Telegraphy at the Fair.—J. C. Kelsey....173-174
Exhibits at the St. Louis Fair....175-184
Subway Construction.—D. R. Craig....185-188
"Let's Talk It Over"....189-196
Concerning Telephones.—Samuel G. McMeen....197-199
Digest of Telephone Patents.—Edward E. Clement....200-204
Digest of Telephone Literature.—Samuel G. McMeen....205-210
Heard on the Party Line.... 211
EDITORIAL—
Are Independent Telephone Securities a Safe Investment?..212-214
Government Plans Independent System....214-215
Test the Product.... 215
Ore Finding by Telephony....215-216
Telephone Insurance.... 216
No Escape from Noise.... 216
The Land of the Telephone.... 216
Conventions of Independents....217-220
Questions and Answers.—J. C. Kelsey....221-222
Strowger Automatic System. III.—F. Lubberger....223-224
Decisions Affecting Telephony.—G. W. Hand....225-226
The Modern Telephone.—S. P. Grace....227-230
Telephony on a Ray of Light.—Matthew C. Smythe....231-232
"Enslavement or Freedom".... 232
The Telephone in Court Circles....233-234
Testing Raw and Finished Material....235-236
The Adams-Randall Telephone Apparatus....237-239
Personal....240-241
The Telephone in Foreign Countries....242-244
The Head-Hunters and the Telephone....245-246
Well Known Heads of Well Known Houses.... 246
Telephone Tales Tersely Told....247-249
MANUFACTURERS' DEPARTMENT—
Kaishing Self-Soldering Protector.... 250
S. E. Company Receiver.... 251
Severe Tests of Miller Anchor.... 251
Clinton Stamping and Electric Company....251-252
Monarch Gong Damper.... 252
Portable Sound Proof Telephone Booth.... 252
Trade Notes....253-257
In the Rural Line Districts.... 258
Incorporations of the Month....259-260
Annual Meetings.... 260

INDEPENDENT TELEPHONE SECURITIES ARE A SAFE INVESTMENT?

SO PHENOMENAL has been the growth of the Independent telephone movement in the United States in the past eight years—or since the expiration of the Bell and Berliner patents—and so rapidly are new Independent exchanges being installed in all parts of the country at the present time, that men in all walks of life with capital to invest are turning their attention from the common industrials and from the ordinary means of investment to the field of Independent telephony, where larger dividends are being realized than in almost any other business that may be mentioned.

The pioneers in the Independent telephone movement had a hard time in putting the business upon a secure footing, and in the early days of the "crusade" the financial returns were not always of the satisfactory character that they now are, but happily that period in the development of the movement has passed, and it is now the rare—the almost unheard of—case where an Independent telephone system does not pay highly satisfactory dividends on the moneys invested—almost invariably 6 per cent and from that up to 15 and 20 per cent. It may truthfully be said that the Independents have at last come into their own; and with this condition of things, and the vast yearly increase in the number of Independent exchanges, the question of the value of Independent telephone securities as an investment becomes daily more and more of a factor in the industrial world and a matter for earnest consideration on the part of capitalists and investors in general.

From time to time this paper has dwelt upon the value of Independent securities and the golden opportunity they offer to men of capital as a permanent investment. It is a subject that has been gone over thoroughly in every telephone, electrical and financial paper in the country, and no publication has more earnestly exploited Independent securities as a wise investment than TELEPHONY. And all that this paper has said in the past in their favor it again reiterates with double emphasis. It is an old, yet ever new, subject, and one that from the very nature of the movement that brought it to the fore in the financial world, will, in the future, be more and more discussed and statisticized in the press and from the rostrum than ever it has been in the past. It is the burning topic of the hour and one upon which investors in every part of the land are asking enlightenment.

The word has gone out that Independent securities are as good, or better, an investment than stocks in National banks; and it is then no wonder that Independent companies are springing up like mushrooms in nearly every city, town, hamlet and crossroads in the United States, for the American people are not slow to recognize and take advantage of a good thing when it comes to the point of investing their dollars.

In proof that Independent telephone companies are earning comfortable dividends, we present the following figures from five of the big cities of the country where plants have been in operation a number of years, and which may be safely used as a criterion for hundreds of other cities and towns in the country, where Independent exchanges are also being successfully operated:

Twin City Telephone Company, Minneapolis and St. Paul, Minnesota.

Capital stock	$1,500,000
Bonds	1,100,000
Subscribers, 1903	10,116

Pays 7 per cent dividends; 1,000 contracts on waiting list.

New Telephone Company, Indianapolis, Indiana.

Capital stock	$400,000
Bonds	800,000
Subscribers, 1903	7,500

Pays 6 per cent dividends.

Rochester Home Telephone Company, Rochester, New York.

Capital stock	$600,000
Bonds	400,000
Subscribers, 1903	6,000

Pays 6 per cent on preferred stock, 5 per cent on common stock.

Citizens' Telephone Company, Grand Rapids, Michigan.

Capital stock	$1,185,000
Subscribers, 1903	14,082

Paid 8 per cent dividends past six years.

Albany Home Telephone Company, Albany, New York.

Operating only one year, paid fix charges and interest and earned 9¼ per cent on its stock.

Ashtabula Telephone Company, Ashtabula, Ohio.

Has just paid its 13th semi-annual dividend of 3 per cent.

Utica Home Telephone Company, Utica, New York.

Stock	$430,000
Bonds	430,000
Subscribers	2,400

In operation one year, paying fixed charges and earning 3 to 5 per cent on stock.

An electrical engineer who is familiar with the Independent telephone movement has compiled the following figures showing the growth of Independent telephony since 1900:

Authority.	Year.	No. telephones.
Twelfth census report	1900	700,000
Manufacturers' statement	1901	1,000,000
Manufacturers' statement	1902	1,370,000
Manufacturers' statement	1903	1,695,000

The manufacturers' statements report an output of from 500,000 to 550,000 per annum, and in estimating the increase, 35 per cent has been deducted in each year for replacements, etc.

The above estimate does not include telephones on farmers' lines or interior systems, which comprise not less than 450,000 telephones. The total number of Independent telephones outstanding is estimated at 3,000,000. The Independent companies always count transmitter and receiver as one telephone, while the Bell companies count them as two. The number of complete Bell insruments outstanding at present is reported at about 2,000,000.

The number of Independent exchanges in 1902 was 5,430, with an average of 252 subscribers each; the present number is at the lowest estimate, 7,000, an average of about 285 subscribers. While the average number of subscribers for each exchange is small, the cities of Philadelphia, Pittsburg and Allegheny, Cleveland, Minneapolis and St. Paul, St. Louis, and Los Angeles, average 10,000 for these six systems; while the cities of Baltimore, Rochester, Buffalo, Toledo, Columbus, Dayton, Louisville, Indianapolis and Grand Rapids average 6,200 each, computed from signed statements received in December, 1903. About 75 per cent of all the cities in the United States having a population of 20,000 or over have Independent telephone companies.

Even with this vast number of exchanges in operation and with nearly 6,000,000 telephones in use it is estimated that less than five per cent of the population use telephones. There need be no question but that within a very few years the number of telephone subscribers in this country will be doubled and trebled, or quadrupled.

There is a demand for telephone service far beyond the ability to supply it. It can be furnished at a low cost. It can bring attractive returns to its owners. Its patrons are the best class of people in their respective localities. The outlook for the future is brighter and more promising than ever it has been in the history of Independent telephony, and Independent securities likewise are growing more desirable each day as an investment.

The telephone business, fortunately, is not susceptible to the ordinary vicissitudes. There is a growing list of subscribers whose bills are payable monthly or quarterly, cash in advance. No long notes are taken. The bills are promptly paid. They do not consist of large single items. While the bills aggregate a large amount, they are distributed among the most reliable people of the community in small single items.

The telephone business is ideal. Its business is practically cash and its resources are not tied up in accounts. Its net income is in the banks ready for distribution among its stockholders.

Another important fact, as to permanency and future development, is that, through the simplicity of telephone service, it can be furnished at a rate within the reach of the humblest of our citizens. The future demand for telephone service can readily be appreciated when it is considered that a given sum of money invested in telephone systems brings a greater return to the investor and subscriber than the same sum of money invested in any other way.

It would seem that the future of the telephone would be that every house, every place of business, and every office containing modern conveniences will soon be provided with telephones as permanent fixtures. All this will accrue directly to the benefit of the Independent cause, and incidentally will add still more to the value of Independent securities.

No class of men has kept closer watch of the development of the Independent field than the bankers of the country. They are, therefore, in a better position to judge of the value of Independent securities than the average business man who has not followed the movement with as zealous watchfulness. On this point Guy Morrison Walker, the well known banker, says:

"The extent to which each of the public utilities is a tax upon the people is not only interesting, but such knowledge is necessary to determine the relative value of the securities of the different companies controlling them, because it indicates the degree to which the people can affect their earnings by the exercise of economy during times of depression. The charge per capita upon population is as follows:

Railroads	$20.00
Street Railways	8.50
Gas	3.50
Electric Light	2.50
Telephone	1.50

"In economizing it is natural and easiest to first curtail those disbursements which are heaviest, economizing last on those disbursements that are smallest, and so least felt.

"The securities of telephone companies offer an investment remarkable for their stability. Their charge upon the people is the lowest of any quasi-public corporation, so low that even in times of depression there is a steady growth in telephone construction and a consequent increase in the number of telephones used. The construction of a telephone plant requires the investment of a smaller capital in proportion to the population to be served than does any other public utility, and when to this is coupled the low cost of operation and maintenance of telephone plants, it will be seen that in the securities of these companies is found the acme of security and value."

As a matter of fact telephone investments, and Independent telephone investments, in particular, are entitled on their earning power to a very favorable consideration by investors, the Independent companies particularly being fortunate in having delayed their period of activity until the time when telephone development had reached a high state of perfection. The Bell companies have been compelled by the successive rebuildings and reconstructions of their plants to invest from two to three times as much money in them as the present Independent telephone companies have for the same size plant. Nearly all Independent plants

recently built have the very latest and best construction, material, and apparatus, thus obtaining the most economy in operation and the minimum of expense for maintenance, while most of the Bell companies are at the present time burdened with old plants, requiring expensive maintenance and hign cost of operation, and are face to face with the necessity of another period of reconstruction to place themselves on a competing basis with their Independent competitors.

At the present time we have in the Independent field some of the ablest men in the profession, commanding the highest salaries paid, and who are responsible for some of the most astonishing results. To-day, methods far in advance of those formerly employed are in use, whereby the investor is assured of a return before a franchise is asked for. To the telephone operator the failure of a telephone proposition is unknown when the proper methods are employed. Estimates are based upon the conditions found, and their accuracy is as well established as in any of the other engineering branches; hence the investor has nothing problematical to deal with.

An authority on the Independent movement and Independent securities is *Finance,* which has the following to say regarding the subject:

"The Independent movement is becoming stronger year after year, and to-day the Independents have many hundred thousand more telephones working than the entire Bell interest has. The telephone field is not fully developed to-day. There is not a community, as far as we can learn, where there is not a growing demand for telephones, just the same as there is a growing demand for gas, electric light and street railway service, but we find the telephone business has gained more rapidly during the past seven years than any of the other companies. The telephone companies combined are handling at least 22,000,000 messages each day, as compared with 4,000,000 in 1895. The combined earnings are at least $125,000,000 per annum, as compared with $30,000,000 in 1895. This shows an increase of more than 400 per cent.

"The Independent telephone companies only need to do four things in order to make their securities understood and give them proper standing:

"1. Get good, strong organizations in all the states in the union with a good national organization which will unite with the state associations.

"2. Where properties are not in good condition improve them so as to give good service, as their income depends upon that. A great majority of the companies to-day are on a good, substantial basis.

"3. Where rates are not on a proper basis, readjust them just the same as you would handle any other line of service.

"4. Consolidate the long distance companies, maintaining all the present interests; do this so as to bring about one first-class long-distance company, which will give service from the Atlantic to the Rockies, and one that will be in position to still make further extensions when necessary.

"With these things done the problem is solved. The public is becoming more in touch with the situation daily. The Independent companies are assuming a more ideal condition monthly, so that those who select their securities today with care will soon find themselves in the same condition as those who purchased underlying securities of the steam railways and other public serving corporations years ago.

To what extent the Independent telephone systems have outgrown the Bell may be judged from the following estimates: In the state of Ohio there are 145,000 Independent telephones to 89,000 of the Bell, an excess of 56,000 in favor of the Independents. In the state of Indiana there are 107,000 Independent telephones against 40,000 of the Bell, which shows the tremendous difference of 63,000 in favor of the Independents. In the state of Illinois the Independent telephones outrank the Bell at the ratio of two to one, and in Pennsylvania the proportion is about the same. Altogether there are twenty-three states in the union in which the Independent telephone is largely in excess of the Bell. With the exception of a few of the large cities, Independent lines reach almost every corner of this country, and Independent long distance lines are being pushed rapidly forward, so that it may be expected that in the near future conversation over Independent lines will be had from the Lakes to the Gulf and from the Mexican border to the Atlantic.

Concerning Independent securities from an investment standpoint, we take the following from a circular recently issued by Leroy W. Stanton, the well-known telephone engineer of Cleveland:

"For a permanent investment, I do not think that the telephone has many equals in the industrial world to-day; for instance, take the street railway—you have rolling stock on which there is heavy wear and tear, and have the tracks to keep up, washouts to repair, bridges to maintain, large coal bills to pay, expensive power houses to keep up, expensive employes, much greater danger risks, owing to accidental killing of someone, etc. You will note that these features are almost totally eliminated in a telephone investment. You have an investment that is not affected by hard times, like most other lines of business; you have an investment that cannot very well be destroyed by fire, as it is scattered over a large amount of territory; you have no expensive salesmen on the road selling your material, you are not compelled to keep large quantities of raw material on hand or large quantities of manufactured material on which to pay interest, taxes, insurance, etc. The prices do not fluctuate as in most other lines of business. The rates are on the rise rather than on the decline.

"It is sometimes stated by persons who are not well informed that telephone securities are not tangible, that they are more of a chattel nature. In a modern telephone plant, constructed after the most approved ideas, this is probably less true than it is of securities of any other public serving corporation. The system is more permanent, less liable to deterioration through mechanical motion, and when discarded there is probably a greater salvage obtained than from almost any other kind of an operating plant.

"When we consider the low expense of maintaining telephone properties in comparison with similar corporations; when we consider the high earning power of a comparatively small investment and the comparatively small depreciation, we realize the value of Independent telephone securities."

We could go on, column after column, giving facts and statistics as to the phenomenal growth of the Independent movement and the rapid rise of Independent securities in the investment market, but suffice it to say that the day will come—and in the not distant future—when Independent securities will be as eagerly sought by investors as are government bonds. The full morning of that day is now here, and the man who avails himself of the golden opportunities now at hand to financially identify himself with the Independent movement and be among those to reap the rich harvest, is wise in his day and generation. There will be chances of this sort for years to come, but the shrewd investor will not wait, he will look about him *now* for the opportunity, and profit thereby.

GOVERNMENT PLANS INDEPENDENT SYSTEM.

THE government of the United States may soon join the ranks of the Independents. The authorities at Washington after suffering indignities for years at the hands of the Bell company have at last revolted and will in all probability throw off once and for all the shackles of this would-be monopoly and rid itself of telephonic conditions that are notoriously deplorable and have been for years.

The existing relations between the Chesapeake and Poto-

mac Telephone Company of Washington and the federal government have become so unsatisfactory that the cabinet after seriously discussing the subject, finally authorized President Roosevelt to have estimates prepared of the cost of installing an Independent telephone system in the District of Columbia for the use of the government departments and the District of Columbia government. Congress has repeatedly enacted legislation attempting to regulate the telephone service in Washington and compel the Bell company to lower its high prices, but the company has successfully carried its case to the courts.

There has recently been a controversy between the company and the government regarding the rate which the government would pay for the almost innumerable telephones in use in the various departments. Comptroller of the Treasury Tracewell gave a decision fixing a rate enacted by law for the government telephone. This decision the company accepted under protest. The constant friction between the government and the company, in the opinion of the cabinet, has become intolerable, and it is believed that the only remedy will be to throw the company's telephones out of the departments and install an Independent service.

This is a move in the right direction on the part of the government. It is just now passing through what has already been experienced by hundreds of cities and towns in the United States, and who found happy relief from oppressive Bell methods by breaking away from that company altogether, joining the ranks of the Independents and securing for the first time satisfactory service at reasonable rates. The cabinet opines rightly that relief may be obtained by throwing out the Bell company's telephones and installing an Independent service for the use of the government. The most surprising feature about the whole matter is that the Washington officials have so long allowed themselves to be hoodwinked and bulldozed by this subsidiary Bell concern. Government officials have only to look around them to learn that the Independents are leaving the Bell company far in the rear, both in the matter of growth and of superior service. As indubitable proof of this assertion let the cabinet officers, if they will, make inquiries in Cleveland, Toledo, Grand Rapids, Columbus and Dayton, Ohio, Los Angeles, Kansas City, St. Louis, South Bend, Indiana, and a thousand other cities and towns throughout the country, and they will find that the service being given at the present time by the Independent companies is so far ahead of the old Bell methods of doing business that there is absolutely no comparison.

The sooner the government installs an Independent telephone system at Washington the sooner will it find out the joy of first-class, up-to-date service and realize what a wholesome relief it is to be at last free from the clutches of the grasping Bell organization.

TEST THE PRODUCT.

MANUFACTURERS who succeed apply continuous and intelligent tests to determine the character of the output and where it shows that it is not keeping up to the standard, they cause something to happen. Whether it is failing for lack of good material, or good supervision, or wrong planning of ways of doing things, the tests enable the trouble to be found and the remedy applied. Sometimes in this very test of product it is discovered that the rate of production of some of the parts or classes could be increased with distinct advantage both to the rate of making and the character when done. Speeding up the engine has cured many an excessive cost of manufacture.

The telephone business is a manufacturing one, and the output is telephone service. If you are in that business, test the product constantly and wisely, so that you may know the quality of the thing made and determine the best rate of making it. The rate of production affects the cost of manufacture in your case as in any other, and it is surprising how little difference is introduced in quality by certain changes in the rate of making.

To make a few dilatory calls from subscribers' stations in a large exchange is next to useless as a means of finding out the character of the service. Counting calls on peg count days tells no service story. To be useful, service tests must be many, and it imposes a hardship on the subscribers to visit their stations frequently on such errands. Visits upon them should be for purposes of inquiry and not for service tests. Let these be made from the central office in ways which are free from the operators' detection, and yet contain all the usual elements.

The fallacy that "three second service" is good service will probably not be exploded soon, but digested experience quickly shows that the speed of answering is not the only measure of good service. Let the answer be quick, as quick as you can get it, but remember that the thing wanted is a conversation free from interruption and with prompt release. Perhaps in most particulars the interests of the telephone company, the operator and the subscriber are identical; but the operator is anxious to get the calls out of the way, while your interests, and those of the subscribers, demand that the conversations be finished things, free from fault and imperfection.

ORE FINDING BY TELEPHONY.

TO STAND on the earth's crust with a telephone receiver to one's ear and call up gold and silver and precious metals from the internal regions, sounds like an Arabian Nights' tale, and yet this is practically what a new invention, seen recently at the Westminster Palace Hotel in London, has made possible. For years past, the feasibility of detecting and locating lodes and ore bodies by means of electric waves has been acknowledged, and now, after much scientific investigation, two engineers with experience of nearly every mining field in the world, Messrs. Leo Dalt and Alfred Williams, claim to have perfected special instruments and apparatus to do the work. There seems little doubt, too, that their claim is well justified, for such an authority as Professor Sylvanus Thompson of London has lost all skepticism in the face of experiments, and has expressed himself as altogether convinced that not only will the apparatus be found of great use in tracking partly worked lodes, but will result in an enormous saving in the making of trial holes. The professor said he did not know anything about gold mining, but for all other metals, except, perhaps, zinc blende, it was likely to be of great practical advantage. It was not at all to be put down in the class of "divining-rods and other toys." There is, however, plenty of favorable testimony from the gold fields of Alaska, South Africa and elsewhere, where the system has come through the most severe tests with the utmost credit.

The apparatus was shown in operation by Mr. Williams, one of the inventors, who had rigged up a boxful of geological strata for the occasion. He explained that the system consisted of transmitting inductors, which deliver electric waves of a definite length extremely sensitive to the presence of minerals, and receiving resonators tuned to detect the waves and determine their characteristics. The operator, with a conducting rod in his hand, goes over the energized field, and through the telephone receives a succession of manifestations of the waves beneath. Sometimes, Professor Thompson stated, the sounds would be as loud and distinct as those made by a woodpecker, the variation and intensity being the greatest, of course, when the resonators were over the lode. By noting density of wave flux, rotation of path and discord or overtone of the waves, information as to the depth, width, and condition of the deposit was obtainable.

The opinion of experts and the success of recent ore-finding trials have led the Electrical Ore Finding Company, a

London corporation, to the decision to at once bring the system prominently before the mining public, not alone of Great Britain, but of the United States and the whole world.

TELEPHONE INSURANCE.

TELEPHONE properties may be insured. But a loss of revenue on the stoppage of service due to a central office fire is complete and absolute for that region during all the time there is no service. This is not true of very many other kinds of business, because most manufacturing concerns—and a telephone company is such—can run overtime to catch up. The only way to insure against the loss of revenue which arises from such a break in continuous service is to pay insurance premiums against it in another form. One such form is to make investments in measures of safeguard, in preventive and precautionary things, the annual cost of keeping which investment may be considered to be an insurance premium. Other precautions are to provide appliances for fire fighting, and methods of organization and of discipline, to anticipate the probability of a disastrous fire, and to realize the extreme advantage of keeping the fire department out of the building when a fire shall occur—a case of "Deliver us from our friends." Such things as these, together with an intelligent choice of a central office location in the beginning, offer the only general way of supplementing the existing insurance possibility.

Fire alone is not the only enemy to fear. High waters have stopped service, and so they may again. In small offices service has been kept going by hoisting the switchboard on a temporary structure. In large ones, the precaution must begin further back, largely in the choice of location, and it may be found good wisdom to pay a larger price in real estate value and annual experience for longer lines, than to incur a water risk which may shut off the revenue.

NO ESCAPE FROM NOISE.

A CORRESPONDENT of the New York *Times* complains of an addition to the horrid noises of the city in the constant ringing of telephone bells. His office is in a large building where there are many telephones, and in the summer when the windows are open the nuisance of these noisemakers is almost unbearable. "I have just complained," he says, "to the telephone company, which advises me that it has a rule which requires the ringing of a telephone bell continuously for three seconds, at intervals of three seconds, for five minutes, unless answered, and at intervals of five minutes the same operation is repeated. When three or four people happen to be away from their offices you can imagine what a strain this is to one's nerves, and it should be stopped."

It would be following precedent to advise this distressed victim of urban racket to seek the calm of rural life, but by a strange coincidence there comes a complaint of rural disturbances from a correspondent of the New York *Sun*. He says: "In the country I am kept awake by a woodpecker, who at about 4:30 a. m. hammers away at the shingles outside my bedroom window." This man suffers in town also, where the rat-tat-tat of the electric riveting machine in a modern steel structure keeps him from sleeping, and he propounds this query: "Would it be worth while to catch the woodpecker and suspend him in a cage close to the electric riveting machine in the hope that he might himself show more forbearance in the future?"

As the woodpecker was within his rights and attending strictly to business, the suggestion is immaterial and untenable. Plainly the offense is in the complainant's own nerves. He should attune himself to a rapping, banging and tooting world, especially at this time when the country is threatened with the unspeakable horrors of campaign music. If the precious interval for preparation is not sedulously employed by both the sensitive New Yorkers we can see their finish in a lunatic asylum.

THE LAND OF THE TELEPHONE.

HERBERT LAWS WEBB, in a recent magazine article, presents an interesting contrast between the use of the telephone in the United States and its use in England. America is the home of the telephone, says Mr. Webb, and it has reached in this country a tremendous development. Public telephone stations are everywhere, in hotels, restaurants, theater lobbies, department stores. There is one hotel in the United States, the Waldorf-Astoria, which has a telephone in every room, 1,200 in all, giving service anywhere in the hotel, in New York city or in the United States.

Furthermore, the use of telephones in the United States is vastly more general than in England, he says. In all of Great Britain there were in service at the end of 1903 about 300,000 telephones. The cities of Greater New York, Boston and Chicago alone had 325,000 at that time and Mr. Webb reports the president of the American Telephone and Telegraph Company as saying in his annual report that the demand for telephonic facilities in all parts of the United States is greater than the supply.

There are several reasons for this and they account for several other things in America beside up-to-dateness in telephone facilities. Instead of merely taking down the receiver to call the attention of the operator, the subscriber in England has to turn a crank and ring a bell or go through some such process, and it is only by the American system that warning is given by an incandescent light the moment the receiver is taken down.

It is clear, says Mr. Webb, that the technical policy of the American telephone companies has been to furnish the best service that can be produced, adopting to that end every improvement that invention has devised and the American companies have adopted also a "forward" business policy which means a great deal. Mr. Webb refers to the American custom of putting the wires underground, thus insuring additional safety, efficiency and economy.

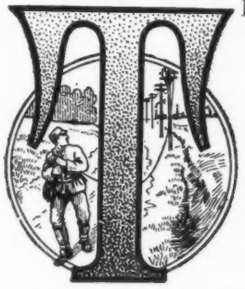
But the most important advance of American telephony over the telephone system of England, Mr. Webb asserts, is the fact that there is no government monopoly of the telegraph in America, and the telephone here has consequently escaped the blight of official interference which has restricted its development in every European country. In the United States the Federal government has wisely left the conduct of telegraph and telephone communication to private enterprise and the results have amply justified its policy of non-interference. There has been absolute free trade in telephoning and the telephone companies have been enabled to build up their business on the broad lines of supplying a public demand in the most efficacious manner.

Mr. Webb's vision is the clearer from the fact that he himself is a subject of King Edward.

In the prize-essay competition at Cleveland among the Cuyahoga telephone employes on the subject, "What Can We Do to Improve the Business of the Cuyahoga Telephone Company?" fifty-seven answers were received. They contained more than 200 suggestions and showed careful consideration of the matter. The prizes weer awarded as follows: First, William E. Neville; second, R. E. Mattison; third, Edward Rauschert. The suggestions of three others, J. W. Barrows, R. Murphy and R. M. Ross, were considered of such merit by the committee that they were also awarded prizes.

Conventions of Independents

INDEPENDENT TELEPHONE ASSOCIATION OF OHIO.



THE Independent Telephone Association of Ohio held a meeting in Columbus August 2, at which representatives of the 300 Independent telephone companies of the state were present. Steps were taken looking toward the standardizing of telephone equipment and the formation of a national association, composed of all the Independent telephone companies in the United States. The organization of the association was also completed.

At a previous meeting of the association held in Columbus the state was divided into nine Independent districts, each presided over by a vice-president, as follows:

District No. 1—J. B. Hoge, vice-president, Cleveland; consists of Erie, Lorain, Cuyahoga, Huron, Medina, Lake, Geauga, Ashtabula, and Trumbull counties.

District No. 2—W. F. Laubaugh, vice-president, Akron; Summit, Portage, Mahoning, Stark, Columbiana, Carroll, Jefferson, Harrison, and Tuscarawas counties.

District No. 3—J. B. Rhodes, vice-president, Zanesville; Coshocton, Muskingum, Guernsey, Belmont, Noble, Monroe, Morgan, Washington, Perry, Athens, Meigs, and Gallia.

District No. 4—G. P. Thorpe, vice-president, Wilmington; Pickaway, Fayette, Vinton, Jackson, Scioto, Lawrence, Pike, Adams, Highland, Clinton, and Ross.

District No. 5—W. G. Thompson, vice-president, Lebanon; Butler, Warren, Hamilton, Clermont, Brown, and Preble.

District No. 6—J. C. Reber, vice-president, Dayton; Greene, Montgomery, Clarke, Champaign, Logan, Shelby, Darke, and Miami.

District No. 7—G. E. Matheany, vice-president, Lima; Marion, Wyandot, Hancock, Putnam, Paulding, Van Wert, Mercer, Allen, Auglaize, and Hardin.

District No. 8—R. E. Hamblin, vice-president, Toledo; Williams, Fulton, Lucas, Ottawa, Sandusky, Seneca, Wood, Henry, and Defiance.

District No. 9—Dwight E. Sapp, vice-president, Mt. Vernon; Crawford, Richland, Ashland, Wayne, Holmes, Morrow, Knox, Union, Delaware, Licking, Franklin, Fairfield, and Hocking.

Meetings of these districts were called and have been held as follows: Cleveland, August 16; Toledo, August 17; Lima, August 18; Dayton, August, 23; Hamilton, August 24; Chillicothe, August 25; Columbus, August 30; Zanesville, August 31, and Canton, September 1. At these district meetings arrangements were made for the election of delegates, to represent them. Measures were also taken to bring the Independent companies of the state closer together and prepare them for the forward movement that is being inaugurated all over the country.

At the meeting in Columbus on August 2 a committee of members of the state association was appointed to look into the matter of standardizing telephone equipment and to consult with leading Independent workers in other states regarding the formation of a national association of Independent companies. The personnel of the committee is as follows: J. B. Hoge, Cleveland; Ed. L. Barber, Toledo; Cyrus Huling, Columbus. In Illinois the exchange managers have already become interested, and the result will likely be a strong organization that will co-operate with all others formed along the same line. The same plan of organization and work will run through from the district to the national body.

Under the new order of things in the proposed national organization there will be a more general representation of Independent companies, and the delegates will be so apportioned that they shall have voice in the conventions more in proportion to the importance of the companies or districts they represent. While national meetings have been held in the past, the smaller companies have wielded the same influence in the deliberations as the larger ones. In the new organization each company will be given representation according to its size.

The Ohio association is at present the most aggressive yet organized. The dominant purpose is to fight the Bell company at all points. The Independents believe that the Bell officials are preparing to make extensive improvements in all their subsidiary branches throughout the country to enable them to compete more effectually with the growing Independents. To meet this the Independents will form a closer compact at all points. The association plan as adopted in Ohio will be immediately extended to other states.

Independent interests have been going at rather a lax gait, it is said, for the last two or three years, and the weakness was not really discovered until the managers were brought face to face with the fact that their instruments were about to be thrown out of the postoffices. President Dickson of the United States Telephone Company and James B. Hoge of the Federal brought their forces together, however, and won a victory on that score. But they were by no means sure that an attempt to overcome difficulties in some other direction might not result in a different way, so it became apparent that the only safe course was a thorough organization of the allied interests.

The basis of representation of the Ohio association in the councils of the organization shall be one delegate in the state convention for each 1,000 telephones, or 1,000 miles of toll lines, and in the national convention one delegate for each 1,000 telephones or miles of toll lines. For district organization one delegate for each 100 telephones or miles of toll lines.

One of the first things to be taken up by the new national organization will be the attempt to secure the standardizing of all Independent telephone equipment. J. B. Hoge of Cleveland, in speaking of this matter, said: "Standardizing of equipment is one of the things that has become a most important problem for the Independent telephone interests. So long as there is such wide diversity in the apparatus and methods of the Independent companies, as exists at the present time, it is not reasonable to expect the best results. In almost every other line of business this principle of standardizing has been most successfully applied. The time has been ripe for some such move on the part of the Independent telephone companies for some time and all that has been needed is some one to give it a start. That we propose doing and shall keep at it until we attain results." Mr. Hoge is already in communication with the Inter-State Independent Telephone Association with the intention of getting it interested in the project and taking favorable action. This association is made up of representatives of the various Independent companies in states of the middle west. It will probably take up the plan at its first meeting. The old Independent association will also be

communicated with and the plan presented to its members. Mr. Hoge firmly believes that it is only a question of time when the Independent interests will have brought about the long-desired standardization of telephone equipment.

Mr. Hoge further said: "The power and importance of the telephone interests of the United States are not fully recognized. We can get together as able and representative a body of men as any business in the country and the only thing necessary is simply to get them together. To bring these men together so that they will attract the attention of the financial and banking interests of the country, will be of great and far reaching importance to the telephone business."

Telephone insurance, which is now under consideration by a committee in Ohio, is one of the important matters that will be taken up by the proposed organization, and from time to time other important questions will be considered.

One of the things that the Ohio association is working strenuously for is the universal adoption of the blue shield as the mark of the Independent long-distance lines. At the recent meeting of long-distance telephone men at Indianapolis, the use of this emblem was decided upon, but its universal use is believed to be of great importance to the Independents.

The question of uniformity of equipment will be the paramount theme at the coming local meetings in Ohio, it is said. Investigation will be made into the trouble which may have arisen from a varied equipment and immediate steps will be urged to remedy this, when changes are made and new supplies of any kind secured. The Ohio Independents are thoroughly awakened on this point and declare that it shall have precedence over all other matters at future conventions.

At the Columbus convention the following facts and figures were brought out regarding the strength and extent of the Independent movement in Ohio:

Independent companies in Ohio have over 183,000 telephones, as shown by the tax returns, against the Bell company's 90,000, including Cincinnati and Cleveland. The Independents have over twice the mileage of toll line in Ohio the Bell has. They also have a very large rural development which the Bell has not. The Independents have accomplished this growth within a period of seven years.

Columbus, in two years, has reached 5,200 subscribers, and the managers of the exchange are now completing arrangements for a new automatic exchange which will accommodate 19,000 telephones, 10,000 of these to be installed immediately.

Toledo, in two years, has installed 7,000 telephones, while the Bell has less than 4,000.

In Champaign county the Independents have over 1,400 telephones, while the Bell has less than 100.

Darke county has over 1,100 Independent telephones, and less than 50 Bell.

Shelby county has over 1,000 Independent, and less than 200 Bell.

Logan county has over 1,200 Independent, while the Bell has nothing but toll stations. Many other counties throughout the state show the same ratio of the Independents to the Bell. These are only a few instances, but they show only too plainly the immense headway that is being made by the Independent telephone companies in Ohio.

There was a meeting of the vice-presidents of the association at Columbus, Ohio, on August 8, at which plans were laid for a thorough organization of the Independent telephone companies of the state.

The executive committee of the Ohio association is composed of the following members: Ed. L. Barber, Toledo; Cyrus Huling, Columbus; Dwight E. Sapp, Mt. Vernon; James B. Hoge, Cleveland. President Frank L. Beam is chairman of the committee *ex officio*.

Among the prominent Independent telephone men of the state present at the Columbus meeting were the following: President Frank L. Beam, Columbus; Cyrus Huling, Columbus; Dwight E. Sapp, Mt. Vernon; Ed. L. Barber, Toledo, and J. B. Hoge, Cleveland, comprising the executive committee; W. F. Laubaugh, Akron; J. B. Rhodes, Zanesville; G. P. Thorpe, Wilmington; J. C. Reber, Dayton; George Metheany, Lima; R. E. Hamblin, Toledo; E. E. Knox, Portsmouth; Ralph Reamer, Columbus.

The officers of the association are as follows:

President—Frank L. Beam, Columbus.

Secretary—E. E. Knox, Portsmouth.

Treasurer and Assistant Secretary—Ralph Reamer, Columbus.

Executive Committee—E. L. Barber, Toledo; Cyrus Huling, Columbus; J. B. Hoge, Cleveland; D. E. Sapp, Mt. Vernon.

District No. 1 of the Ohio Independent Telephone Association held a meeting for the purpose of organizing the district at Hotel Euclid, Cleveland, August 16. The state is divided into nine districts, district No. 1 comprising the counties of Ashtabula, Cuyahoga, Erie, Geauga, Huron, Lake, Lorain, Medina and Trumbull. The district contains about fifty operating companies, including small companies operating farmers' lines, most of which were represented. Frank L. Beam, president of the state association, and several of the vice-presidents, together with representatives of manufacturers of Independent telephone equipment in the district, were also present.

James B. Hoge, chairman of the district, outlined the plan of organization for the state; each company to be entitled to one delegate to the district association for each 100 telephones or 100 miles of toll line in their system, the districts to hold semi-annual or quarterly meetings for the purpose of considering matters of importance to the district; the districts to elect annually one delegate to the state convention for each 1,000 telephones or 1,000 miles of toll lines, the state association to consider subjects of importance to the Independent telephone companies of the state; the president of the district organization to be one of the vice-presidents of the State Association. In case this plan should meet with the approval of a sufficient number of the Independent telephone interests of the United States, and should be adopted by a national association, each state could then be organized along the same lines, and each state at its annual meeting could elect delegates to the National Association, this meeting to be based on one delegate for each 10,000 telephones or 10,000 miles of toll line. The National Association would then consider points of special importance to the Independent telephone interests of the United States and take action upon such business as might be submitted to them by the various state organizations. In this way the Independent telephone interests of the United States would be a unit.

Mr. Hoge gave as the four principal points to be considered by the district the following:

1. Importance of all companies adopting certain standards of equipment and operation.
2. Division of territory.
3. Guarding against a second Independent company entering the field.
4. Organizing to prevent any Independent companies becoming licensees of the Bell.

President Beam of the State Association urged the importance of thorough organization along the lines suggested. Each of the companies represented was given an opportunity to make a report, and all expressed themselves as being in sympathy with the movement and promised to give the organization their hearty support. From figures given it developed that in many counties of the state there is scarcely any Bell competition, that company having no exchange and only a few toll stations in some counties;

in others the Independents have many times the number of telephones operated by their competitor. Mr. Beam spoke of the counties of Morrow, Delaware, Knox and Licking, which center at a point near Centerburg, Ohio, and which he and his associates have developed quite extensively. The total number of telephones operated by the Independents in this territory is 7,922, as compared with 1,685 by the Bell; in Morrow county alone the Independents having 1,500 telephones, while the Bell has no exchanges and only three toll stations. In District No. 7, comprising ten counties in the northwestern part of the state, G. E. Matheany of Lima said the Independents have 18,000 telephones in operation, while the Bell people have but 6,000, as shown by careful reports recently compiled.

After a short talk by Mr. Clapp, engineer for the conference committee, a large map showing the long distance lines of the six companies comprising the conference committee, with their connections from Pittsburg to Topeka, Kansas, was displayed. A number of designs of the shield adopted by the Ohio Independent Telephone Association and the conference committee of Independent long distance telephone companies as the emblem of Independent telephony for use on pay station signs, stationery, etc., were exhibited.

C. L. Norton was elected secretary for the district and the following executive committee appointed:

S. R. Newberry, Ashtabula county; W. B. Woodbury, Cuyahoga county; E. L. Coen, Erie county; Dr. Pomeroy, Geauga county; D. Calhoun, Huron county; C. M. Grauel, Lake county; A. V. Hageman, Lorain county; B. Hendrickson, Medina county; Washington Hyde, Trumbull county.

Meeting of District No. 8 of the Ohio Independent Telephone Association was held at Toledo, at the Boody House, on August 17. The counties represented were Williams, Fulton, Lucas, Ottawa, Sandusky, Seneca, Wood, Henry and Defiance.

After R. E. Hamblin, vice-president of this district, and acting as chairman, had called the meeting to order, a motion was made that H. B. Taylor, auditor of the Toledo Home Telephone Company, be made temporary secretary of the meeting. Later, by a motion that was made and carried, he was unanimously elected permanent secretary.

Addresses were then made by Frank L. Beam, president of the Ohio Independent Telephone Association; James B. Hoge, vice-president of District No. 1; M. B. Overly, general manager of the United States Telephone Company; D. E. Sapp, vice-president of District No. 9; Mr. Morrison, connected with the Toledo Home Telephone Company; and Cyrus Huling of Columbus.

The thorough knowledge of the Independent situation that was brought forth in the addresses was of such character that the most beneficial results will be the outcome. Following these addresses, the secretary called the roll of the individual representatives of the counties mentioned. The information obtained of the conditions prevalent in this district was carefully noted, and the immense amount of enthusiasm displayed for a co-operative spirit made the meeting very spirited and a great success.

The executive committee that is to represent each county was not elected, inasmuch as the conditions of this district are of such importance that the chairman thought it advisable to weigh the matter and select, after due deliberation, representatives whose work would be most beneficial to the county that they would represent.

Mr. Stinson, operative manager of the Toledo Home Telephone Company, gave a very interesting talk on the many benefits that they have voluntarily offered to their patrons at Toledo. Judge Donnelly of Henry county, and O. L. Spangler of Williams county, besides other representatives, made addresses in which they set forth the conditions that were associated in the territory they represented.

NORTHERN KANSAS INDEPENDENT TELEPHONE ASSOCIATION.

The Northern Kansas Independent Telephone Association held its annual meeting at Concordia, Kansas, recently. In the absence of the president and vice-president the meeting was called to order by George G. Hill of Concordia, and John Doyle of Belleville was elected chairman. Business of a general nature was transacted, and the following officers were elected for the ensuing year:

President—John W. Doyle, Belleville.
Vice-President—C. W. Baldwin, Osborne.
Treasurer—George G. Hill, Concordia.
Secretary—D. C. Tyler, Clifton.

The president then appointed the following committees:

Executive Committee—T. M. Dolan, Clifton; George G. Hill, Concordia; C. W. Trice, Clay Center; C. W. Brown, Abilene; E. A. Dye, Logan.

Arbitration Committee—W. R. Nelson, Smith Center; W. R. Evans, Marysville; Harley Pierce, Belleville; H. H. Smith, Republic City; J. R. Loomis, Osborne.

The chair then appointed as a committee to look after legislation, the following named gentlemen: W. R. Nelson, Smith Center; T. M. Dolan, Clifton; R. C. Postlethwaite, Jewel City.

The committee on resolutions, consisting of John A. Morton, C. S. Dittman and E. A. Dye, reported as follows:

Whereas, The members of the committee on resolutions are led to believe that the toll service done by the various companies composing this association is more or less unsatisfactory, therefore, be it

Resolved, That we recommend that steps be taken to carry into effect the resolution adopted at the regular meeting held January 5, 1904, to provide for better service, more especially from Clyde, Kansas, east.

Much enthusiasm was manifested at the meeting, owing to the rapid growth of Independent telephony in northern Kansas, the universal prosperity being enjoyed by the Independent companies now doing business in the state, and the thriving condition of the association, which is doing a good work in spreading the gospel of the Independent movement in the west.

SOUTHEASTERN KANSAS TELEPHONE ASSOCIATION.

The Southeastern Kansas Telephone Association held a very interesting and important meeting at Galena, Kansas, on August 15. The principal object of the meeting was to discuss plans to put the Independent toll line system in the eight counties in that part of the state and the northeastern part of Indian Territory in shape to connect with the Kinloch Long Distance Telephone Company at Joplin, Missouri, and Pittsburg, Kansas. Plans for better and more extended farm telephone service were also discussed.

The territory covered by this association includes Chautauqua, Elk, Wilson, Montgomery, Neosho, Labette, Crawford and Cherokee counties, in Kansas, and the Indian Territory lying north and east of the Arkansas river. At the meeting on the above date the companies occupying this territory agreed to parallel their existing circuits with a sufficient number of No. 10 copper metallic circuits to enable them to connect with the Kinloch and give service to St. Louis and the east and Kansas City and the north. They also decided to establish a clearing house for the purpose of making uniform rates and adopting a system for handling the business interchanged among themselves as well as business to points outside this district.

The plans, when completed, will give the Galena-Joplin lead and zinc district, the coal district and the gas and oil

district first-class Independent toll service, and connect the same with the Kinloch long-distance lines at the above named points.

MINNESOTA INDEPENDENTS IN CONVENTION.

By the time that this issue of TELEPHONY reaches its readers the annual convention of the Minnesota Independent Telephone Association will have been held. It was planned to hold the meeting on the state fair grounds in Minneapolis August 31 and September 1. This brings it too late for a report of the gathering in our present number, but the deliberations of the convention will be duly recorded in our October issue. It was expected that there would be a large attendance of Independent telephone men and manufacturers.

No formal programme had been arranged, but J. J. Nate was down to read a paper on "The History of the Telephone," and it was expected that several other well known telephone men would also address the convention.

The committee of arrangements consisted of J. J. Nate, chairman; L. L. Brooks and L. D. Richardson, all of Minneapolis.

The Minnesota Independent Telephone Association was organized June 10, 1902, at a meeting called at the Nicollet Hotel in Minneapolis. A constitution and by-laws were drawn up and adopted and the following officers were elected: President, Dr. J. H. James; first vice-president, Hon. J. A. Tawney; second vice-president, J. J. Greaves; third vice-president, E. L. Bradley; secretary, W. Howard Mears; treasurer, Joseph Lockey. Dr. James is still president of the association, while the offices of secretary and treasurer are filled by R. F. Clark of Hector and E. H. Moulton of Minneapolis.

The association organized with ten memberships and has had a steady growth since that time. It was expected that a large number of new members would be enrolled at this meeting.

NORTHEASTERN IOWA INDEPENDENT TELEPHONE ASSOCIATION.

The following letter has been sent out by S. S. Lichty, secretary of the Northeastern Iowa Independent Telephone Association regarding the convention of that organization to be held at Independence, Iowa, next month:

"The executive committee of the Northeastern Iowa Independent Telephone Association has instructed me to issue a call for a meeting to be held at Independence, Iowa, on Thursday, September 8. The sessions will commence at 10 o'clock a. m. and will be held in parlors of the Gedney Hotel.

"It is hoped that you will be able to lay aside business for a couple of days and attend this meeting. An excellent programme will be given, and it will be both entertaining and instructive. Every member of the association should make it a point to be present; and should you not be a member of it, a cordial invitation is extended you to be one.

"Vice-President Van Vors of Independence informs us that the Buchanan County Fair will be in progress and there will also be a good theatrical attraction in the city. Independence is a good convention town and has one of the finest hotels in the state of Iowa—the Gedney. This meeting will be far too good to miss. If you can't spend two days with us, make it one."

The officers of the association are as follows:

President—Vic Stevens, Dubuque.

Vice-President—J. F. Van Vors, Independence.

Secretary-Treasurer—S. S. Lichty, Vinton.

Executive and Arbitration Committee—Vic Stevens, Dubuque; J. F. Van Vors, Independence; S. S. Lichty, Vinton; E. C. Hampton, Marion; W. V. Shipley, Iowa Falls.

INDEPENDENT ASSOCIATION ORGANIZED.

A meeting of managers and owners of Illinois Independent telephone companies was held in the Illinois Hotel in Bloomington recently, the object being to organize the Central Illinois Independent Telephone Association. There was a large attendance, and at the forenoon session it was decided that such an association would be of mutual benefit to all concerned. Manager Schuler of the Independent company at Streator was elected chairman of the meeting, and R. C. Crichfield of Minier secretary.

Owing to the fact that there are many places where there is need of new toll lines to connect hundreds of Independent exchanges, so that they may have better long distance service, it was unanimously decided to appoint a committee to look after the toll line interests of the many companies represented, and the chairman named F. Z. Ames of Rutland, J. W. Barrett of Pekin, and L. C. Swertfager of Lincoln, as such committee.

It was also decided to make the association a permanent one, and the following committee was chosen to prepare a constitution and by-laws, and to call another meeting in the near future at Peoria: Albert Schuler of Streator, R. C. Crichfield of Minier, and L. F. Hyneman of Lexington.

Much enthusiasm was manifested at the meeting, and it is believed great good will be accomplished through the association in the betterment of toll and exchange relations. The association expects to embrace the entire central portion of Illinois, and when organized it will represent about $10,000,000 invested in telephone exchanges and toll lines.

MINOR MEETINGS.

The Southwestern Telephone Association held its quarterly meeting at Wichita, Kansas, recently. The principal topic of discussion was "The Betterment of Oklahoma Toll Lines." About fifty managers of Independent telephone lines in Oklahoma and Kansas were present.

Several of the managers of Independent telephone exchanges in the vicinity of Grand Rapids, Michigan, recently held a conference at the exchange building of the Citizens' Telephone Company in Grand Rapids relative to interchange of business and adjustment of toll rates.

The telephone girls connected as operators with the Consolidated Telephone Company of West Virginia held a convention recently in Clarksburg, West Virginia. Elkins, Belington, Philippi, Fairmont, Salem, Brown, Buchannon, Weston and Clarksburg were represented, twenty-six young ladies in all being present. General Superintendent J. Walter Barnes, recently nominated for congress in that district on the democratic ticket, had the convention in charge, which was entirely social in character. After the session an elaborate dinner was served at the Hotel Waldo.

GROWTH OF RURAL LINES.

The growth of rural telephone lines in North Dakota is one of the striking signs of the times. Within five years there have been many lines established in sections of the state not reached by the Northwestern company. Towns with Independent exchanges were connected and the farmers began to establish lines to the towns and with each other until dozens of little systems were established, many of which are being merged into more pretentious lines. Traill county is perhaps better covered by rural lines than any other section of the state, though Cass and other counties have been extending in the past year or two. This summer miles of lines will be built all over the state. A representative of an eastern concern who makes the northwest in the interests of a telephone line supply house says there are more orders in sight in North Dakota than in any other part of his territory.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

Last month you described the conditions whereby a telephone line was rendered extremely noisy, when one wire of three-phase circuit became grounded. I have noticed this same condition in our city, although everything is what is called single phase, with a voltage of 2,000. When one of these wires becomes grounded, our lines become noisy, from the very reason that obtains in the three-phase circuit, with which I am not familiar. Is this not true, that the single phase alternating circuit of 2,000 volts, when grounded on one side, will give a 2,000 volt electrostatic stress, as you say, to the telephone lines in the vicinity?—J. W. C., Minnesota.

The conditions are certainly the same. When one side of the circuit is grounded, it stands clear to you that the other side of the circuit is above ground, just the potential of the generator. If the circuit has 2,000 volts pressure, then your telephone lines suffer from this pressure, which is electrostatic in nature, and if weak or unbalanced great noise will certainly result. Most lines will stand a 550 volt trolley pressure, but when forced to meet the 2,000 volt conditions, they fail. I will tell the readers of an experience right in line with this subject which happened in East St. Louis since the August issue, and which gave me a chance to demonstrate to some of TELEPHONY's readers the exact conditions given by W. M. of Indiana in August TELEPHONY. During a storm—a violent one, too—the lines of the Bell and Kinloch telephone companies in certain districts became very noisy, and could be easily traced to a 60-cycle generator, from the note so painfully apparent in the receivers. In the vicinity of these afflicted lines is a power and light company, using three-phase alternating current, of 60-cycle frequency. For a part of the way the Bell lines paralleled this three-phase circuit, and for the rest of the way the Kinloch lines—in all, about three miles of exposed lines, for both companies. The ground detectors of the lighting company did not reveal a ground, hence the five or six days of conjecturing where the trouble exactly lay.

Being in the city and hearing of the trouble, and anxious to prove that TELEPHONY was not publishing rot about such matters, I made a few tests. Theoretically, I was certain that a ground existed on the power lines. To prove it, I arranged a voltmeter, connecting it ground, and with the other terminal wire touched the ends of the three wires, when the switch was pulled. Instantly the voltmeter gave a reading, ranging from ten to twenty volts, which proved at once that a ground existed, because there was no other way for an earth current pressure to be visible. This power line ran parallel with a trolley line, and everyone knows that a difference of potential exists all along the track, ranging all the way from one to ten volts per mile, or more. When I got the reading of an average fifteen volts, I knew that a ground existed up the line. Just how far, it could not be exactly said. But an examination of the track at the power house showed poor bonding, and I assumed a drop of ten volts to the mile along that track. A drop of fifteen volts, between our station ground and the offending ground, would mean then a mile and a half up the track. I can say to the readers that the trouble men went up the line, and at a point nearly a mile and a half distant they found one of the wires down in a puddle of water, thereby proving the truth of the theory, or rather fact. When the wire was lifted from the pool of water, the lines became so quiet that one would suspect they were disconnected.

The readers will pardon me for telling my own experience so much, but along the lines of power and telephony together I confess to a weakness, for every telephone man should have a thorough knowledge of power, and every power man should know something of the conditions of the telephone. They are no intertwined that I cannot see how they can be separated. Telephony is a high tension long distance power transmission scheme. The transmitter generates a current at a low pressure, and an induction coil steps up the pressure, so that the feeble current can be carried long distances, without great loss. It seems to me that the transmitter is a generator, and should be called such. It is a generator and tends to constant current regulation. It presents many power characteristics, and I hope to see the day when the transmitter will have its deserved place among the mighty engines of modern transportation.

I have a peculiar case of trouble on one of the lines coming into the exchange. I have a metallic line running ten miles into the country, and have three telephones installed. The first telephone is six miles from the exchange, and can ring down the drop on the board. But the other two telephones cannot ring down the drop, and the only way we can get their signal is to keep the plug inserted, and get the signal with the clearing out drop. How can I clear up this trouble?—O. L. C., Tennessee.

At first thought, I would suspect that the first telephone on the line has a low resistance, or series bell, or has some trouble, causing a path for the current, which ordinarily should ring down the line drop. But when the clearing out drop falls readily, the burden of proof lies with the line drop itself. It must be a sluggish, low resistance drop, of the series kind, and poorly adjusted. The current from the end generators is not available at the drop end of the line, on account of the great potential drop. I would suggest that a bridging drop be placed instead of the series drop; and also a condenser placed in the drop circuit might give efficient aid in throwing down the drop. A condenser has a very high resistance to the alternating ringing current, and will tend to prevent the drop of potential caused by the low resistance drop. It will store up energy, and may help to give the drop the little extra impulse it needs. I simply suggest a trial of this.

I noticed in your last number, in Questions and Answers, the last question from J. M. N., California. Now I am in the same condition and want a position on the road for a good house. The address of the firm you gave him did not appear plain to me, at least I could not make it out in my number.—J. A. W.

The name of this concern is simply "Hapgoods," and their Chicago office is in the Hartford building. I did not intend to advertise this firm, and only suggested it because I am certain that such an organization is necessary in this age. It is a go-between for the firms who want men, and among those men who want to work, who have ambition, energy, and are looking for higher things, it will certainly be an agent for good. Many young men spend years groping about for a place that should be spent in making a reputation with some employer. I therefore suggest this agency, not from a mercenary standpoint, but from a standpoint of saving a young man many years of useless, idle employment.

Concerning the query of the W. T and S. C. in the July number of TELEPHONY, it seems to me at a glance that it is a case of ground, or weak generator, as No. 4 ground is too weak for No. 5 generator, and No. 5 generator is too weak for No. 4 ground. No 4 may have a ground strong enough for other telephone generators,

but bells ring medium, not strong or weak. No. 5 generator may ring other bells medium, not strong or weak, but cannot ring No. 4 bell. Changing instruments would not clear trouble, if instrument and ground are strong and in good shape.—J. H. M., Wisconsin.

The readers may remember this query, whereby thirteen bridged parties were connected to a grounded line. No. 5 could ring all parties but No. 4. No. 4 could ring all parties. All parties but No. 5 can ring No. 4. If No. 5 wants No. 4 they have to call other parties to ring No. 4 for them. The answer of J. H. M. is a step in the right direction, though hardly clear. I will leave the question open for another month.

Are there any standard dimensions in the construction of an induction coil for a local battery transmitter? I see that some manufacturers turn out a coil that certainly must be much lower wound than others. I would like to know why all coils are not nearly alike. Is there any definite electrical law involved? What are the factors that enter into the calculation for size and length of core, size and number of turns of wire in each of the primary and secondary windings, and the step-up ratio. Can I get any information on this subject in Norries or Bonnies Induction Coils?—U. S. R.

There is one sure thing, that standards do not as yet exist in the manufacture of telephone apparatus. Each company designs its induction coil for the transmitter that they make. As no two transmitters are exactly alike the coil will not be alike. The Bell company has a special coil for long distance instruments, with the primary and secondary nearly alike. Used in connection with operators' instruments the induction coil necessarily has a high resistance secondary, because the operator has to break into a conversation, without seriously impairing transmission. I cannot imagine any electrical law involved, except a ratio of primary and secondary turns. In regard to induction coils, I have no information regarding the processes of their design and manufacture. The factors that enter into the size and length of the core in ordinary transformers depend upon the number of lines of force to be generated for certain pressure. The number of turns also depends upon the number of lines to be generated. The size of the wire is, of course, dependent upon the amount of current carried. The ratio of primary and secondary pressure depends upon the relative number of turns. If 1,000 volts is to be raised to 10,000, then the secondary will have ten times the number of turns, of accordingly smaller wire, because one-tenth of the current is to be carried. But the final standardization of induction coils is a question that one fears to discuss. I am not aware of any books upon induction coils by Norries or Bonneys.

How much does a splice in No. 12 wire cut down its strength and power of transmission? We have a telephone line, ten miles long, BB wire, No. 12, with coils half a mile long. That would make forty splices in the ten miles, which are regularly made, and soldered with the ordinary wire soldering acid.—E. B. S.

There might be an objection to the use of soldering acid, as that will cause corrosion after a time. If it is carefully wiped off, no trouble should be given. Splices will not materially weaken the line in either sense. I have seen splices, from lines taken down after fifteen years of use that measured 2,000 ohms. While this would not seriously interfere with local traffic, for local battery transmission, it proved a serious obstacle for common battery work, as the signals do not work satisfactorily above 750 ohms. For your purposes, the forty joints should give no trouble. They are a necessary evil.

At the World's Fair there are two methods of wireless telephony on exhibition. One is called a radiophone, and the other the Hutchinson system of wireless telephony, in which the court of the Palace of Electricity is used to demonstrate the range of the sounds. Do these two systems represent all the advance made along the lines of wireless telephony?—F. M., Kentucky.

The radiophone uses the selenium cell, which has been described in TELEPHONY before. This selenium has the property of changing its resistance, in proportion to the amount of light thrown upon it. In darkness, the resistance is just half what it is in the light, and gives quite a decent range for the transmission of music. The voice is not tried at St. Louis, but a bugler plays for fifteen minutes each hour. Just how successfully the voice is transmitted, I cannot say. It makes a nice exhibit, and people wonder how a beam of light can carry sound. This method may be said to represent the very latest advance in wireless telephony. One hears a great deal about wireless telephony in connection with wireless telegraphy, but it is all a fraud, when it is given out that the voice can be carried on the electrostatic waves used by telegraphy. There may come a time when the simplest of music can be transmitted for 500 miles by electrostatic methods, but it is not here yet. Wireless telegraphy deals with alternating currents of one frequency, and who can say that voice can be carried on the wings of a one-cycle current? It stands to reason that it cannot. Two frequencies are used for the purpose of keeping the messages from being interfered with, but that is done at separate stations. For instance, station A telegraphs to C, using a 60-cycle current. Station B can also telegraph to C, without interfering with A's messages, if they use a 133-cycle current. Then the operator at C can put his telephone receiver in series with another receiver, and the first operator records the 60-cycle note, while the other operator listens to the 133-cycle note. Of course, the 60-cycle operator could hear the 133-cycle note, but it is not his duty. That is the way, and the only way, that so-called successful tuning is done.

But returning to the Hutchison method of wireless telephony. In this system we return to real principles of telephony. A battery, a special transmitter, and a primary loop comprise the primary circuit. In the Court of the Palace of Electricity one has a space of 60,000 square feet in which the sounds of the transmitting station are conveyed to the ear. The loop is buried in the ground, is of insulated wire, composed of several turns. When the operator speaks, or sings, or plays the tunes of a phonograph into the transmitter she varies the current passing through the primary loop. The whole court is full of varying lines of force, and all that is needed is an exploring coil which will cut these lines of force and produce in the loop feeble currents varying according to the original primary current. The marvelously sensitive receiver, in circuit with the loop, converts these varying currents into recognizable sounds. So anywhere in the court the operator talking into the transmitter can be heard. The operator can be a mile away, and can talk to the people in the court nearly as plainly as the ordinary telephone conversation. The whole idea is like this—if a party takes a primary winding off an induction coil and rewinds it in a big loop about the circle of the court, and connects it exactly as the ordinary induction coil primary with battery and transmitter, and then takes off the secondary from the induction coil, mounting it on a rim of fair size and connecting a receiver in the circuit, he will have an exact operator's induction coil circuit, without an iron core. The vast size of the primary loop offsets the absence of the iron core. It is amazing how well the method works. Any park could be fitted with this scheme, with a transmitter at the telephone office. Would it not be unique for a telephone exchange to advertise that it would give election news by wireless telephony? It could be given to people in a park or theater or in any place. Every telephone man visiting the fair should give both wireless exhibits a thorough examination. The wireless telegraph tower should be visited, and the entire DeForest system fully investigated. This is the only system on the grounds, and their observations along the line of inland wireless telegraphy are well worth a place in the world of scientific demonstration and utility.

It is said that Atchison, Kansas, has more telephones than any other town of equal size in the world. Nearly 1,800 telephones are in use in that city.

Strowger Automatic System. III

F. LUBBERGER

AN EXPLANATION of the so-called "series system" was given in the August issue of TELEPHONY. Its principle lies in the line relays of thirty ohms being inserted in the talking circuit. There are some other systems, the principles of which I will shortly explain.

In the so-called bridging system the line relays are bridged across the lines. The switch remains mechanically the same and the wiring is not very materially changed. The line relays remain bridged after completion of the call. There is hardly any deflection of the voice currents, as the bridges have high ohmic and very high inductive resistance. The releasing is done by means of these bridges.

In another system the switch is cut off from all relays and coils and inside of the exchange a third line is used for releasing purposes similar to the third wire in a three-wire cord circuit.

An attempt to describe all the circuits as they are worked out would lead me too far away from the intention to give information about the fundamental designs and circuits of the Strowger system. I wish to state emphatically that by no means is the Strowger system limited to the described circuits. What I intended to describe is the arrangement of the exchanges as they are working now. In other words, if I did not touch the question of a common talking battery system it is not because the Strowger system would exclude it by its principles. It may be kept in mind that a battery is bound to be connected somewhere to the system, and there is no principal objection to using this battery as a common talking battery.

To conclude the description of the circuits, we review the system and condense it into a short summary.

The Strowger system belongs to the individual switching class. The call is made by lifting and rotating a shaft carrying connecting members for the talking and guarding circuits. The main principle is the automatic trunking from one group to another group by means of automatically selected trunk lines, using one or more mechanisms of almost identical design.

Many telephone men do not favor automatic systems, because they suppose them to be "stiff," or rather, not flexible. Countless special wishes must be satisfied cheerfully in towns where competition is keen. The more one gets familiar with the Strowger system, the more one finds out that there is no specialty which cannot be mastered. In the following discussions I will enumerate some of such "specialties."

Some stations need more than one line of the same number, i. e., offices of newspapers, large stores, etc. Only one number appears in the directory, but as many trunks as there are needed go from the exchange to the station. The principle of such an arrangement can easily be understood. This automatic picking out of the first unoccupied trunk is rather one of the fundamental Strowger principles. In this case it is used to select unoccupied subscribers' lines, just as it was used in the exchange to pick out the first idle trunk to the secondary switches.

Trouble might be expected from the secrecy of the operation in case of fire alarms. It might be supposed that any bad boy may falsely alarm the fire department, because nobody could find out who made the call. It can be arranged so that the fire department has its number specially wired. Any first selector calling this number is prevented from releasing, at the same time alarm is given in the exchange room. Under such circumstances the calling station can be found out and the number reported. In case of a false alarm the subscriber is held responsible. When making a fire alarm, of course, all companies, or a part of them, are called simultaneously, according to the circumstances. Besides that, every station may be called individually for private conversations, and a fire call goes to the telephone even if it should be called privately.

It is sometimes necessary to transfer a call from one line to another during certain hours, i. e.: A physician has a residence telephone at home and an office telephone down town, and he wishes calls to his office telephone transferred to his residence telephone during the night. This is accomplished by connecting the two first selectors together, using some simple precautions in doing so.

In large exchanges the load is not distributed equally over the sections. The boards containing the first selectors of down-town offices are naturally more frequented than residence sections. It is sufficient to give a trunking capacity of five lines to these boards, although in practice usually ten trunks are equipped, i. e., ten connections are placed on such boards. A trunking capacity of ten per cent may not be sufficient for very busy sections. Before erecting the exchange it might be known, and from the start a larger number of connections will be equipped on that board. It may happen that the present equipment is not large enough, and it is to be increased. To explain how this may be done we assume it to be necessary to have twenty trunk lines to board No. 3,200, i. e., it shall be possible to make twenty calls into group 3,200 to 3,299, and simultaneously any number of calls may go out of this board.

We remember that in the ordinary exchange the banks of the second selectors in the third thousand group are all multipled together. The second level is tapped by ten trunk lines at the 200 board and the trunk lines end at the ten connectors of the 200 board. Instead of multipling the banks of the second selectors over the whole thousand group we make two groups of multiples. We combine the second selectors of boards 3,000 to 3,400 into one group and the second selector banks of boards 3,500 to 3,900 into another group. From the second level of the first group we have to run ten trunk lines to ten connectors on the 200 board, and from the second level of the other group we have to run ten more trunk lines to ten other connectors in the 200 board. In other words, one-half of the whole exchange uses the ten connectors mentioned first; the other half of the exchange uses the second set of connectors.

By this we are able to equip any number of trunks. But twenty trunks might be too much and ten too little. How about fifteen trunks? We need not cut the whole second level in doing this; we are able to equip just as many trunks as it is advisable to provide. The cutting in of new trunks can be done any time, without the slightest disturbance of the working parts, and a manager can follow an increasing demand on very short notice.

It may be mentioned that the Chicago exchange has a trunking capacity of 19 per cent; Dayton, Ohio, 15 per cent; Grand Rapids, Michigan, 15 per cent and 10 per cent; Lincoln, Nebraska, 10 per cent. In the busiest sections in Grand Rapids never more than nine or ten trunks are occupied.

I leave now the purely automatic exchange and enter the discussion of the combination of a Strowger exchange with different manual arrangements. Toll connections will never be handled automatically. It is not the place in this article to discuss the reasons. There are two distinct methods for toll connections in the Strowger exchange, one for light toll traffic and one for heavy toll traffic. In each case a regular lamp signal toll board with one or more positions is to be used. For small toll business the toll operator has a regular telephone number, say No. 500. A subscriber wishing toll calls 500 in the regular way. The operator answers, gets order and requests the subscriber to hang up his receiver and to wait until she calls him. After the toll operator has completed the toll connection she inserts the mate of the plug used on the toll side into one of the trunk jacks to the automatic switchboard and calls the subscriber automatically. The toll conversation goes over the automatic board. For outgoing and incoming toll calls the toll board is equipped in the standard way. For connections between the toll lines and the automatic subscribers the toll board is equipped with an automatic calling device, which can be connected to any cord by throwing a key belonging to the cord. Some trunk lines lead from jacks at the toll board to the automatic switchboard and end there like subscribers' lines on first selectors. There may be equipped any number of trunks, and it is easy to increase the number if the toll traffic gets heavier.

The circuits are designed in such a way that the standard two-side lamp signals are displayed in supervising the connections.

For large toll traffic I will describe one arrangement, picking it out from several similar ones. From the main distributing frame the lines go in the regular way to the first selectors. At the same time a separate pair of wires for each line is brought from the main distributing frame to a so-called "switching section," that is, a manual board with as many two-spring and sleeve jacks as there are subscribers, each pair of wires ending at the jack of its number. One or two so-called "switching operators" are employed on this board. The recording operator has no number any more, but on the dial of the telephones an eleventh hole is provided, or the words "long distance" are prefixed to the hole "O." A subscriber calling "O" raises his first selector to the tenth level, which is directly connected to the recording operator. Upon pushing the ringing button a lamp signal is displayed on the recording operator's desk. The operator connects herself to the line, gets the order and requests the subscriber to hang up his receiver. The recording operator passes the order to the proper toll operator, who makes the desired connections. After securing them she communicates over an order wire with one of the switching operators, who designates a trunk between the toll board and switching section. The toll operator inserts the mate of the used toll-calling plug into the trunk and the switching operator connects this trunk directly with the subscriber's line by inserting the plug in which said trunk ends. By this a purely manual connection is established and all signals are arranged according to manual practice. It may be mentioned that when such a toll connection is made the first selector of the called line is made "busy" so that it cannot be called over the automatic exchange.

Without much description it can be understood that manual private branch exchanges can be operated in very much the same way as in purely manual practice. The Strowger automatic exchange is adapted to operate together with existing manual boards. In Los Angeles, California, the capacity of the Independent exchange was to be increased. The manual board had been installed not long before and it would have been too expensive to replace it. As an extension a 4,000 Strowger exchange is now in course of erection. The two exchanges are made to work together by a switching section in the automatic exchange, and some special trunking sections at the manual board. The manual exchange is called "main" and on the automatic telephones the word "main" is prefixed to the number hole No. 1. An automatic subscriber wishing connection to a manual subscriber rotates his dial from number hole No. 1 and pushes his ringing button. This lights a lamp signal at the manual trunking section in the "main" exchange. The operator answers and completes the call in the ordinary way.

A manual subscriber wishing connection to an automatic subscriber signals his operator in the ordinary way. The operator by order wire gets a trunk from her position to the switching section in the automatic exchange and the switching section operator completes the purely manual connection by plugging into the jack of the automatic subscriber.

A very interesting application of the Strowger switch is made at Traverse City, Michigan. There the manual board had outgrown its capacity and it was necessary to put in either multiple jacks or something else. Strowger switches were used in place of line multiples. The exchange is equipped for 1,200 subscribers. Every subscriber's line is made to terminate at a drop and jack at the regular operator's position and at the points of some connector banks. The connectors are operated by the operator, i. e., from each position two or more automatic lines lead to just as many connectors in each hundred group not accessible to the operator. So the operator serving group 620 to 750 has at her disposal three connectors to 00-99, three to 100-199, two to 200-299, two to 300-399, etc. The operator for group 200-340 has another set of connectors. If an operator has to make a connection to a position she cannot reach by her cords she plugs into the automatic jack and calls the subscriber automatically. As only two moves of the dial must be made, the hundred being given by the selection of the trunk jack, considerable less time is required than in a transfer board, and the cumbersome wiring of the line multiple is avoided.

I finally have to enter the discussion of party lines in connection with the Strowger exchange. It is easy enough to hang two or three telephones on a line and have them distinguished by one, two, three rings. But such an arrangement is disagreeable above all for the called party. It is never a good policy to compel a subscriber to count the rings any time the bell rings. He is detracted from his business for nothing if the call is not for him. This system is used to some extent.

A few remarks about the power to operate the Strowger exchanges may be of interest. In large exchanges two storage batteries of twenty-six cells each are provided with the necessary charging machines. For 10,000 subscribers a capacity of about 360 ampere hours per battery is sufficient as long as the local battery talking circuit is used. The maximum current ever seen yet in a Strowger exchange was flowing during some time after the cut over from a manual board to an automatic board. The traffic over the new board was about 1,500 calls established and released in each five minutes. This required an average current of 40 to 50 amperes. Normally in a busy exchange for 6,000 subscribers the current is about twenty amperes at the busiest hour.

The ringing machines are in duplicate, one running in daytime from the commercial power, the other running from the battery as night supply.

In small exchanges a battery is used also, but no ringing and no charging machines are required. The charging is done from a direct current circuit and the ringing is done by means of a so-called pole exchange. This is a small machine with a pendulum set in motion by a motor magnet. The pole changer is started from the off normal springs of the switches. So no current whatever is used as long as no switching operation is going on. This is a very agreeable fact for small exchanges where a constant waste of current would make itself noticeable by swelling the monthly bill for the electric power. Small exchanges may be run from batteries with sixteen ampere hours and less.

WHAT IS ORDINARY CARE?

IT is a rule that linemen in working on their poles must exercise "ordinary care" with a view toward protecting passersby on the roads. In a case before the Kentucky Court of Appeals early in the year one Warner was driving along the road on which the Cumberland Telephone and Telegraph Company was erecting wires, and while near a particular pole on which the linemen were working, owing to the wires being drawn extra taut, the pole broke and fell on Warner and injured him. The question before the court was whether the company's employes had observed the ordinary care which the law charges them with in performing their work. The jury found that the company was liable. The Court of Appeals in discussing the case defined ordinary care as follows: "It is that degree of care usually exercised by ordinarily prudent and skilful men in like occupations and under circumstances similar to those proved in this case. The failure to exercise such care is negligence." The court said that inasmuch as the jury found that the company's employes had not observed this care sufficiently, Warner was entitled to damages for the injuries received by the falling of the telephone pole. The question of whether ordinary care has been exercised in a great majority of cases is to be decided by a jury and the definition above given is perhaps as good a one of what ordinarily constitutes it as could be framed.

Cumberland Telephone and Telegraph Co. vs. Warner, Court of Appeals of Kentucky, 79 S. W. 199.

DUTY TO REMOVE FALLEN POLES.

The Kentucky courts have said that it is the duty of a telephone company to use ordinary care to keep its poles and wires in repair and if they fall in the street the duty devolves upon the company to prevent them from remaining there to the interruption of travel. If the presence of wires in the street makes travel dangerous, and injuries to pedestrians are sustained by reason thereof the company is liable if it knew, or by the exercise of ordinary care could have known, that the wires were in the street in time to have removed them before the injury.

West Kentucky Telephone Co. vs. Pharis, 78 S. W. 917.

PLAINTIFF HAD NO INTEREST IN HIGHWAY.

When the owner of land adjoining a highway does not own any interest in the highway the New York courts have said that where his rights as an abutting owner are not interfered with by the erection of telephone poles along the highway, the owner of the adjoining land cannot maintain an action for the removal of the poles.

Halleran vs. Bell Telephone Co., 67 N. E. 1124.

RIGHTS ACQUIRED IN CONDEMNATION PROCEEDINGS.

What rights does a company acquire when it obtains a right of way by condemnation proceedings? This question recently came up in a railroad case in Kansas, and the law, as therein declared, is very applicable to telephone companies. It is a general rule that "rights acquired by eminent domain are limited rights and extend no further than for the purposes expressly declared in the proceedings." This company had acquired a right of way or easement for the purpose of constructing a railroad in Cherokee county, and later it was found that there were minerals under the land so taken. The Supreme Court of Kansas said that "by statutory proceedings to condemn a right of way for the construction of a railroad, only an easement for that purpose is taken." "There remains in the owner the *fee* to the premises, and a right to take all subjacent minerals therefrom, except such as shall be necessary for surface support." While it is evident that telephone companies would seldom acquire a right of way of any extensive width, yet the point in the case in which the above quotation is taken, is of practical applicability and discloses the rule of law that condemnation proceedings vest in the corporation seeking the privileges only those rights expressly obtained by the proceedings, and are generally limited to the necessary uses of the corporation.

Missouri K. & N. W. R. Co. vs. Schmuck, 76 Pac. 836.

COMPANY FAILED TO RECOVER REVENUE TAX.

The United States Circuit Court of Appeals for the Second District of New York recently decided a case brought against the New York Telephone Company by a collector of internal revenue in that state. The company had a contract with some of its subscribers to furnish telephone service at the rate of 600 messages for $90. The war revenue act of June 13, 1898, imposed a tax of one cent for each telephone message where the charge was fifteen cents or more. Some $20,000 had been paid on the basis of this flat-rate tax which the company in this suit sought to get back, claiming that the law did not cover flat rates, and applied only to single messages, where the charge was fifteen cents or more. The court, however, ruled that the law applied wherever the amount per message was fifteen cents or more, regardless of the kind of contract entered into with the subscriber.

New York Telephone Co. vs. Treat, Circuit Court of Appeals, Second Circuit, 130 Fed. 340.

ELECTRICITY CONVEYED OVER CONFLICTING WIRES—DUTY TO FURNISH BEST MECHANICAL DEVICES.

An action was commenced in the Circuit Court of Chesterfield County, Virginia, to recover of the Richmond & Petersburg Electricity Railway Company for damages occasioned by fire caused by electricity being carried from the street railway company to the plaintiff's place of business. The street railway company had placed its wires under the telephone wires, and it took the position at the trial of the case, that, inasmuch as its wires were under those of the telephone company, it was under no obligation to erect guard wires, provided the distance between them was sufficient to avoid contact, by reason of the sagging of the telephone wires, providing the telephone line was properly constructed. The court said that the company was only required to exercise reasonable and ordinary care in this matter, but that this question was for the jury. The defendant also sought to shift the responsibility on the ground that it had secured a prior right in erecting its wires, and that the telephone company, by placing its wires near the defendant's wires, had placed an additional burden upon the defendant, for which it could not be charged in an action of damages

brought under the facts in this suit. The court decided against this contention.

The manner in which the telephone line had been constructed was before the jury, and the court further said that it was not error to refuse to give the instruction and that the law presumed that the telephone company, in erecting its line, used all ordinary precautions for making its wires safe. On the question of the duty of companies of this character to furnish modern mechanical appliances, it was said that the burden rested upon the defendant to avail itself of the *best* mechanical inventions in practical use, which are effectual to prevent injury from its wires coming in contact with the telephone wires. There is a greater degree of care required in this than is incumbent upon the master toward his servant, who is only required to use ordinary care in such matters. From the above it is easy to determine the responsibility which companies owning conflicting wires are under toward each other in carefully guarding property rights from the danger of fire occasioned by the conduction of electricity in this way.

Richmond & Petersburg Electric Railway Company vs. Rubin, 47 S. E., 834.

EMINENT DOMAIN IN GEORGIA.

In a condemnation suit by a telegraph company against a railroad company in Georgia, to obtain a right over the latter, the Supreme Court of the state was called upon to discuss several important points relating to proceedings of this character. The syllabus of the court is so concise that the following is quoted verbatim:

1. On the appeal from the ward of the assessors on the condemnation proceedings, the issue of fact for the jury is, the amount of compensation to be paid for the private property taken or damaged for public purposes.

2. A telegraph company acquires an easement to the right of way of a railroad company condemned for the purpose of constructing and operating a telegraph line thereon.

3. The easement acquired embraces the land actually occupied by the poles and fixtures for guide wires; a right to stretch wires upon the poles, and enter upon the right of way to construct and repair the telegraph line.

4. The only exclusive right of occupancy the company acquires by condemnation proceedings is the occupancy of land occupied by the poles, for telegraph purposes.

5. The measure of damages is the extent to which the use of the highway by the railroad company is diminished by its use by the telegraph company.

6. Thus, a possibility of poles falling upon the track is too remote to be considered for estimating damages.

7. The inconveniences must be real and of such a character as to interfere in some manner with the railroad's right to exercise its business, to become an element of damage.

WHEN AN INDIVIDUAL CAN COMPLAIN OF LOCATION OF POLES.

Under what conditions can an individual legally complain of the presence of telephone poles as being a nuisance in public streets? The Missouri Court of Appeals has discussed this question and has said as follows:

"The erection of telegraph poles in city streets cannot be complained of by one not suffering special damage, such erection being authorized by statute and ordinance." (12 Mo. App. 485.)

Granting that the company has a legal right by statute and ordinance to do business, it is safe against prosecutions by individuals in all cases where the individual has not a grievance for which he can specially claim damages. If the individual should seek to prosecute, owing to his mere dislike to the location of poles, he would have to do it through the public prosecuting officers, unless he could prove that their location had caused special damage. As a matter of fact, few cases ever arise in which any but special damages are complained of. But the rule, as declared in the Missouri case, fully answers the above question.

CONTRACTS MADE OVER TELEPHONE.

In a case in a western state it has been decided that where two people discuss the terms of a contract over the telephone, the contract is, in law, made at the place of residence of the party accepting the offer. This important ruling would have a good deal of bearing in cases if suit were brought to recover under such contracts. It is a familiar rule of law that the law of the place where the contract was made governs, and this decision may have much influence in settling the questions concerning the place of the formation of contracts where the parties reside in different states.

74 Pac. Rept., 855.

INJURED BY BEING THROWN AGAINST POLE.

A telephone company, with knowledge that the main travel at a street crossing was around and close to one of the angles formed by the intersection of streets, set one of its poles at a distance of 9½ feet from this angle, leaving a passage of that width between the pole and two posts which stood on the angle. The wife of one Billingsly attempted to drive a gentle horse through this passage, and, as the vehicle was passing between the pole and the posts, the horse made some unusual motion which caused one of the forward wheels of the buggy to strike the pole. The occupant was thrown from the buggy and injured. Suit was brought against the telephone company owning the pole, charging the company with being liable for maintaining the pole in an unsafe and dangerous position, and alleging that its position, so near the intersection of the streets, was the proximate cause of the injuries. The Court of Civil Appeals of Texas, which heard the case, has said:

"In the absence of statutory authority, the erection and maintenance of poles in a public thoroughfare by a telephone company, would be a nuisance, if the right of the company to place them there did not exist. So, it would seem that, when one undertakes to defend such an act under the statute, it is for him to show that he brought himself within its terms. And, unless he proves that the poles were placed in such a manner as not to discommode the public in the use of the streets, there is a failure of such proof on his part."

The court held that in law, the pole was in a dangerous position, and that the only question was, whether it was the proximate cause of the injury. It held that the location of the pole, so near to a main traveled part of the city was, and not the momentary swerve of the horse, the proximate cause of the collision which resulted in the injuries.

Alice Wade City & C. C. Tel. Co. vs. Billingsly, 77 S. W., 255.

BULL WRECKS TELEPHONE LINE.

When the telephone company did not care to extend its line to include J. C. F. McKesson of Emerald, Nebraska, he promptly connected the official wire with his barbed wire fence and then had the company connect with the instrument in his home. This worked fine and was cheap, but it gave Mr. McKesson a fright the other day. He was in Lincoln and had just begun a conversation with his home. While he was talking he heard a ringing, a snapping and a scream. It was raining and of course Mr. McKesson thought of lightning. He hastened home. There was no damage. He did not need to call a surgeon. Instead he had use for staples and hammers. A bull had got tangled up in the wire fence and had torn down a section. Then the herd had stamped around over the improvised telephone wire.

The Modern Telephone

S. P. GRACE.

THE transmission of articulate speech beyond the ordinary range of the human voice has been the goal towards which scientists have labored for centuries. To-day, observing on every hand how readily speech is transmitted from one section of the country to another, we are inclined not to realize the great amount of mental and manual effort that has been necessary in order that our speech be extended over hundreds and even thousands of miles. To understand clearly the electrical and mechanical principles made use of in the modern telephone system, it is first necessary to acquaint ourselves with the physical laws underlying speech. It is well known that sound has its origin in the vibration of the molecules of the air, which alternately give rise to atmospheric condensations and rarefactions; i. e., changes of pressure. The condensations and rarefactions of the air reaching the drum of the ear throw it into vibration. The vibration of the ear drum excites the acoustic nerves and in some way, not wholly comprehended, convey to the brain the impression of sound. The simplest form of sound vibration is that produced by the ordinary tuning fork, which gives out a round, full tone of fundamental character. The most complex sounds in nature are those of the human voice, which by slight changes of inflexion convey an entirely different meaning with the same words, though apparently of the same loudness and the same pitch.

Sound may be divided into three general characteristics, loudness, pitch and quality. One sound may be louder than another, due to a greater amplitude of vibration of the body producing the sound, which therefore produces greater condensations and rarefactions in the atmosphere. Again, two sounds may be of the same loudness, but of a different pitch, or technically speaking, a different number of vibrations per second. As an example of pitch, suppose we strike the key C in adjacent octaves on a piano. The number of vibrations per second of C in the higher octave is just twice that of C in the lower octave.

The last characteristic of sound, that of quality, is, perhaps, the most important. Very few sounds in nature are

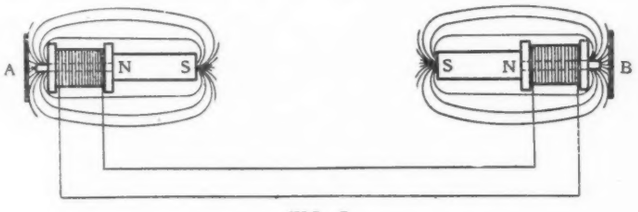


FIG. 1.

fundamentals. Practically all musical instruments and the human voice in particular give out sounds composed of partial tones, or overtones, in combination with the fundamental tone. As a familiar example consider a vibrating string stretched between two points. By plucking the string in the center it is possible to make the string vibrate as a whole and thus give a fundamental tone of a pitch depending upon how tightly the string was stretched. The tighter the string is stretched the greater will be the number of vibrations per second, and the higher the key of the note produced. Should the string be plucked away from the center it will be thrown into sectional vibrations. If the string vibrates in two parts we would then have the fundamental note combined with the second overtone; if in four parts, with the fourth overtone, and so on.

In general then the quality of a sound depends upon the number, the intensity and the position of the overtones. It is this arrangement of the overtones which makes the same note on a violin different from the same note on a piano, a guitar, or a mandolin. The overtones are also responsible for the differences between human voices. Because of the variety and number of the overtones the sounds produced by the vocal cords are of a very complex character, and the resulting air waves have vibration rates ranging all the way from 200 to 5,000 per second. To the great German scientist, Von Helmholtz, is due our knowledge of the laws governing the quality of sound.

To transmit the sound waves of the human voice electrically to a distance is at once seen to present many serious problems. Obviously an electrical current must be capable of changing and reversing many hundreds and even thousands of times per second. It was not until 1876 that Alexander Graham Bell succeeded in making one diaphragm perform exactly the same evolutions as a diaphragm located many feet away, and which was thrown into vibration by means of a human voice spoken against it. Bell clearly saw that if speech was to be transmitted electrically it must be done by a current which was undulatory in character, and that the circuit must never be electrically broken. The telephone of Bell was delightfully simple; it consisted merely of a magnet provided with an extension iron pole piece, about which piece was wrapped a few turns of insulated wire. The placing of a thin iron diaphragm in front of the pole piece and separated from it by a small air-gap completed his invention.

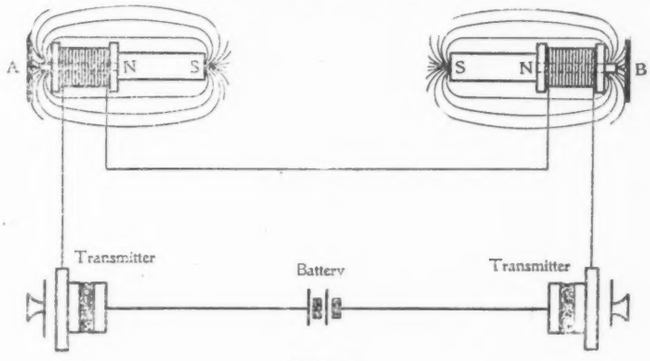


FIG. 2.

Bell's telephone will act either as a transmitter or a receiver. I have shown in Fig. 1, a skeleton diagram of Bell's original telephone, and, in fact, the telephone receiver exists to-day practically as designed by Bell twenty-five years ago. If the diaphragm of *A* be spoken against it will be thrown into vibration in nearly exact accordance with the condensations and rarefactions of the air waves striking it. The diaphragm being made of iron will therefore, by its change of distance from the pole piece, permit a greater or lesser flow of magnetic force through the coil of wire on the pole piece. Because by changing the field of magnetic force through a closed coil there is set up in it electrical currents which are directly proportional to the rate of change of magnetic force. Suppose the wires from *A* are connected into a similar instrument at *B*. The varying current from *A* traversing the coil at instrument *B* will increase or decrease the magnetic field of instrument *B* and will therefore

Note.—A lecture delivered before the Electric Club of Pittsburg, Pennsylvania, by S. P. Grace.

vary the pull upon its diaphragm. Obviously diaphragm *B* will be thrown into vibration and its vibrations will be practically identical with the vibrations of diaphragm *A*. Since the vibrations of diaphragm *A* correspond with the sound waves produced by the vocal chords of the person speaking at *A*, similar sound waves will be set up by the diaphragm at *B*. These, reaching the ear of the observer at *B*, will actuate his ear drum and the acoustic nerves will convey to his brain the impression of the sound waves as originally spoken at *A*.

The original Bell instrument, though transmitting and receiving speech with remarkable clearness, was still inadequate for use as a transmitter because of the faintness of the transmission. Bell's instrument as a receiver is one of the most remarkably delicate instruments known to electrical science. This may be fully realized from the statement that one two-millionth of an ampere will produce an audible sound in a Bell telephone receiver.

It was only a short time until the genius of Berliner and Edison evolved a transmitter which would act, so to speak, as a valve on a source of electrical energy. When Bell's instrument is used as a transmitter the energy of the sound waves conveyed to the diaphragm produces the electrical energy in the coil around the pole piece. From the well-known law of the conservation of energy it is obvious that the amount of electrical energy cannot exceed the mechanical energy of the vibrating diaphragm. The Berliner and Edi-

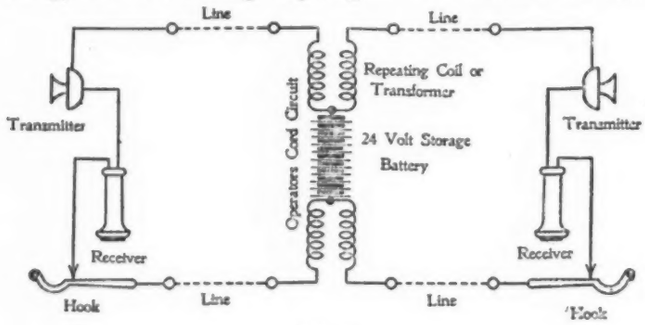


FIG. 3.

son transmitter depends upon the variable resistance of two bodies placed loosely in contact, when subjected to changes of pressure. The most successful forms of transmitters make use of the variable resistances between two carbon electrodes separated by means of carbon granules. It has been found that if one of these electrodes be connected to a diaphragm which is spoken against, the resistance of the carbon will vary in accordance with the pressure upon the electrodes and therefore with the condensations and rarefactions in the air waves striking the diaphragm. If there is a current of electricity from a battery flowing through this contact it is clear that the current will be varied in exact accordance with the sound waves striking the diaphragm.

In Fig. 2 is shown two transmitters and two receivers connected serially in a circuit containing a battery. When either transmitter is spoken into, a variable current is produced in the circuit which will produce a varying magnetic field in both receivers and force their diaphragms into vibration. These receiver diaphragms will perform the same evolutions as the transmitter diaphragm which is spoken against, and will therefore reproduce speech. That the diaphragms of both the transmitters and receivers are capable of taking up the minute overtones of the human voice is truly remarkable. That this is so is conclusively proven by the fact that familiar voices are at once recognized in the telephone, which would not be the case if the number, intensity and position of the overtones were not practically the same at the receiving end of the line as at the transmitting end. The overtones of some letters are very numerous and complicated, and are very difficult to transmit electrically. This is particularly true of the letter S and a number of other consonants. Strictly speaking, the received sounds have not exactly the same quality as the transmitted sounds, but they are sufficiently clear for practical purposes.

It has been very often asked why a permanent magnet is used in a telephone receiver. One reason is that if no permanent magnet be used the received sounds will be an octave above the sounds at the transmitting end. It is also because the amount of movement of the diaphragm for a small change of current is within practical limits proportional to the strength of the permanent magnetic field. Suppose in a telephone receiver that H equals the initial permanent magnetic force. Then the force acting upon the diaphragm is proportional to the square of the magnetization of H^2. If the magnetization increases a small amount h, due to a slight change of current in the magnetizing coil, the pull on the diaphragm will be $(H + h)^2$. The difference or change in pull will therefore be $(H+h)^2 - H^2 = 2Hh + h^2$. From this formula it is evident that the pull on the diaphragm will increase without limit as H, or the initial magnetization, is increased. The practical limit, however, is the degree of magnetization at which the iron in the diaphragm becomes saturated.

The secret of a good transmitter lies in the arrangement and treatment of the carbon electrodes and carbon granules. In designing the solid back transmitter used by the Bell telephone companies many years of careful laboratory experimentation were required before a thoroughly efficient and durable grade of carbon was produced. For transmitter use I may say that a carbon of almost glass hardness and extreme durability is required.

Electric light and power engineers very rarely have to deal with frequencies exceeding 125 cycles per second. To the telephone engineer who deals in frequencies of 300 to 5,000 per second, 125 cycles appear ridiculously small. While the telephone currents are not of large magnitude it is readily conceived that because of their high frequency the distorting and attenuating effects of self-induction and capacity are very marked. It is imperative, therefore, on all long aerial lines and cable lines that the distributed capacity be a mimimum. Great care must be exercised not to place impedance in improper places in a telephone circuit, for if this is done serious choking effects may be produced on the telephone current, or if the line is so long that the transmission assumes a wave form there may be serious reflections of current from improperly placed impedance coils. Telephone engineers dealt with capacity and impedance long before their importance was realized by electric light and power engineers and were obliged to develop apparatus and lines which would work under these severe conditions of high frequency. The most recent work on this subject has been done by Dr. Pupin, who has shown how largely to counteract the effects of disturbed capacity by means of distributed self-inductance. In Pupin's system impedance coils, known as load coils, are placed at recurrent intervals in the line depending upon the wave length.

The telephone receiver and transmitter which I have dedescribed would be of little value in the business world if some means were not provided so that conversations could be carried on between any two instruments in a system containing thousands of telephones. The invention of the telephone receiver and transmitter started the march of invention of central office switching devices.

Until the last decade the systems of switching were, to a great extent, crude, and were rapidly proving themselves incapable of handling the vast volume of traffic which they were called upon to carry. About seven years ago the old magneto-type switchboards were abandoned and were replaced by the common battery systems of to-day. The three great advantages of the common battery system may be summed up as: First, improved quality of service to the public; second, increased speed of operation; third, reduction of maintenance.

Of the different common battery systems, the repeating

coil system is the one most generally used. This is shown diagrammatically in Fig. 3. One large storage battery is used as a source of current for all the lines. Two telephone lines are connected by two flexible cords, in which are placed repeating coils which are simply transformers having the same number of turns in primary and secondary coils. The two lines are connected to the main battery as shown. It is apparent that any change of current in either telephone circuit, caused by a variation of the transmitter resistance will, through the action of the transformer, be reproduced in the other or receiving telephone circuit. Any number of lines, with their repeating coils, may be connected to the one battery with no danger of "cross-talk" from one line to another. "Cross-talk" would be caused if the variable current in one repeating coil caused a change in the current in another coil, but on account of the low resistance of the battery this is not possible.

Fig. 4 represents the complete connections between two subscribers through a repeating-coil, common battery switchboard. At the left of the diagram is shown the connections of a subscriber's telephone. The apparatus in the telephone consists of a transmitter, a receiver, an induction coil, a condenser, a polarized bell and a hook switch. The functions of the transmitter and receiver have already been explained. The induction coil, which is nothing more than a small transformer, is used so that the receiver will be out of the line circuit, which includes the main battery. It has been found that direct current through the receiver is liable to demagnetize the permanent magnet and to injure the diaphragm. The condenser is placed in the instrument in order that the two sides of the line circuit may be kept open to the direct current which tries to flow from the central office main battery, thus preventing the operation of the line signal relay at central. The operator can ring the polarized bell at the subscriber's telephone through the two microfarad condenser, since for ringing purposes single-phase alternating current is used, which passes readily through the condenser.

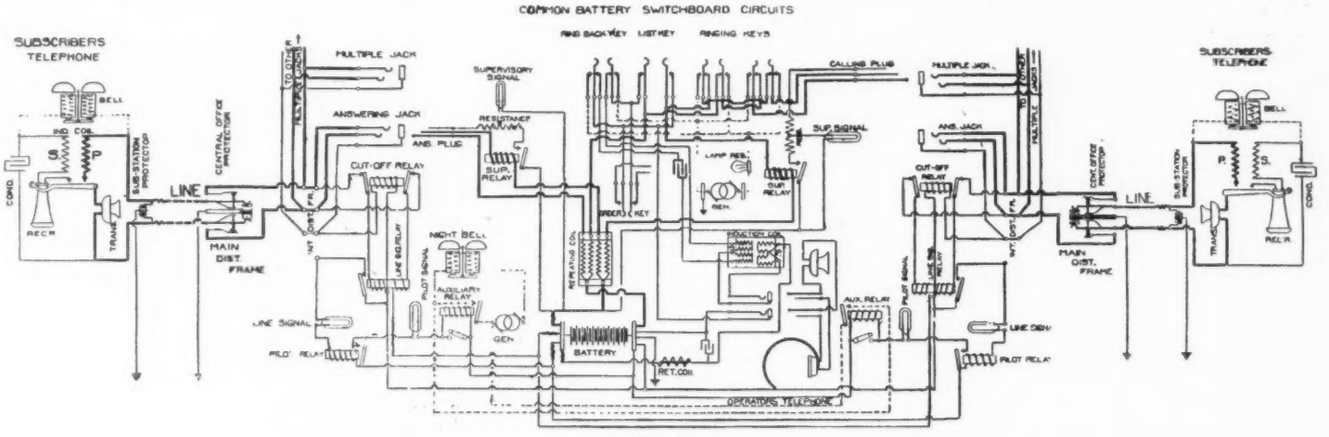


FIG. 4.

The underground and outside wire plant of a large telephone exchange is very extensive and great skill is required in the proper designing and the construction of the underground conduits, pole lines and aerial cables so that a high insulation may be maintained on all the lines and so that the wire plant will be valuable for use at any point where service is demanded. It is clear that no matter how good our instruments or our switchboards may be, without good line construction poor service will result. The best practice of to-day recommends that as much of the wire plant as is economical be placed underground and that where the distribution is not heavy enough to warrant underground conduit, that the wires be run in aerial cables on short heavy pole lines. These cables are made up of twisted pair wires insulated with spiral wrappings of paper and the whole enclosed in a continuous lead sheath. As many as 600 pairs of wires are sometimes placed in a single cable. The reason for using a paper insulated and lead covered cable is, first, because of its low cost, and, second, that with a paper insulation we obtain a very low mutual static capacity of each pair of wires. This low capacity is necessary in order not to seriously attenuate or distort the high-frequency telephone currents traversing over the circuit.

On entering the central office the cables are ended in what is called the main distributing frame. From this the pairs of wires pass through arresters or protectors to the intermediate frame and then to the switchboard. Each telephone line appears on the switchboard in a switch which is known as an answering jack. In addition, the line appears in what is known as the multiple jacks in every third position of the entire switchboard. The purpose of the multiple jacks is to enable any operator to plug in any line. This completes the connection of a subscriber's line to the switchboard. The remaining connections shown in Fig. 4 are for the connecting plugs containing the repeating coils, the operator's telephone and the signals.

It will be seen that in the switchboard three wires and three jack and plug contacts are used for each line Two of these wires are for the talking circuit, the third being a signaling or controlling circuit for the operation of the various relays, signal lamps, etc., which are necessary for a proper supervision of the connection.

When the subscriber removes his receiver from the hook, the rising of the hook will close the contacts of the switch and close the line at the subscriber's station through the transmitter, the primary of the induction coil, and the hook switch contacts. The line being now closed will permit of current flowing through it from the main battery, and since the line signal relay is inserted serially in this circuit at the central office its armature will be attracted, which, closing a secondary circuit, will cause the lighting of the line lamp in the face of the switchboard adjacent to the answering jack of the subscriber who has called. The lighting of the line lamp is practically simultaneous with the removing of the receiver from the hook.

As previously stated the operator is provided with a number of pairs of double-ended plugs and cords which are so wired as to permit of the connection of two subscribers' lines. Upon seeing the line lamp light the operator will pick up a plug connected to one of her answering cords and insert it into the answering jack associated with the lighted line lamp. The inserting of the plug in the answering jack causes a flow of current in the controlling, or third wire circuit. It will be noticed that this current in the third wire flows through the cut-off relays, thus causing its armature to attract and open the circuit through the line lamp. This causes the extinguishment of the line lamp automatically. As the subscriber has his receiver off the hook the line is closed at

the telephone, and as soon as the plug is fully inserted the line current, which the instant before was broken by the cut-off relay, is re-established through one-half of the repeating coil and the cord circuit. The current flowing in the main line will cause the operation of the 10-ohm supervisory relay which is placed in series with one side of the cord circuit. This relay being operated will connect the 40-ohm shunt around the supervisory lamp which, therefore, will not receive sufficient current to be illuminated. The operator will now depress her listening key which will connect her telephone set in parallel with a cord circuit which is connected to the subscriber's line. She will now speak into her transmitter and obtain from the subscriber the number wanted. The operator's set is practically the same as an ordinary telephone, but arranged with switching devices so that it may be connected to the various cord circuits.

Upon receiving the number wanted the operator will take the calling plug of the same pair of cords and reaching to the multiple jack of that number will touch the sleeve of the jack with the tip of the plug. In Fig. 4 the called subscriber's line is represented at the right of the diagram. If the subscriber's line wanted is plugged at some other part of the board the potential of the sleeves of all the multiple jacks of that line will be raised above the earth and under this condition if the sleeves of any of these multiple jacks are touched by the tip of a plug there will be a rush of current through the cord circuit which will cause a click in the operator's ear and thus inform her that the line is "busy." If the line wanted is not busy, which would be indicated by silence when the tip of the plug is touched to the sleeve of the jack, the operator will fully insert the plug and depress one of her ringing keys connected to the cord. This will send a single-phase alternating current over the line of the called subscriber through the condenser and bell located in his telephone. The ringing of the bell will summon the called subscriber to his telephone.

The insertion of the calling plug has operated the cut-off relay and will prevent the called subscriber from flashing his line lamp when he answers the call. However, until the called subscriber answers, the supervisory relay connected with the calling plug will not be operated and, therefore, no shunt will be around the supervisory lamp. The supervisory lamp will thus be illuminated and will clearly indicate to the operator that the called subscriber has not answered. She will, therefore, keep on ringing until he answers or finally send back a "don't answer" report to the calling subscriber. Should he answer, current will flow through both sides of the line from the right-hand half of the repeating coil and will operate the supervisory relay which will shunt the supervisory lamp and cause it to be extinguished. The connection now being completely established the two subscribers will converse with each other on the principles already described. When the conversation is finished and both subscribers hang up their receivers both lines will be opened at the hook contacts and the supervisory relays will release. This will remove the shunt from around the supervisory lamps and cause them to be illuminated. The lighting of the supervisory lamps connected with the cord circuits indicates to the operator that the conversation is finished. She will then remove the plugs from both the answering jack and the multiple jack and all circuits will return to normal and all lamps will be extinguished.

The circuits herein described show the connections which take place for local connections between two subscribers connected with the same office. In a modern telephone system in a large city this is only one of the many hundreds of circuit combinations which must be used. There must be provided suitable trunks and signals between relay offices for local connections and for toll connections, trunks between long distance boards and local boards, order wire circuits many are the circuit combinations that a complete description of them is practically impossible and would be out of place in a paper of this character.

UNIQUE NEW BUILDING OF COLUMBUS CITIZENS' TELEPHONE COMPANY.

The new building now being erected for the Citizens' Telephone Company of Columbus, Ohio, will be unique in many ways, and it is the intention of the officials to make it as perfect a telephone building as exists in the country. The structure will be as nearly absolutely fireproof as possible, both as regards its contents and the surrounding buildings. The window frame work of the building will be entirely of metal. The fourth story of the building, which will contain the new telephone equipment, will have no windows except on the Third street front, being lighted by skylights which will be constructed of steel frames with heavy wire glass.

The floors of the building will be constructed of the Columbian fireproofing system, which calls for the use of concrete, and some of these floors are figured to carry perhaps heavier loads than any building which has yet been constructed in Columbus. The entire structure of the building will be of steel, which is to be thoroughly fireproofed at every point. The partitions of the building will be of hollow terra cotta tile, and the entire building will be equipped with the most modern appliances in the way of plumbing, heating and ventilating. The top floor, which is to contain the telephone apparatus, is to be ventilated by a mechincal system, calculated to remove all particles of dust from the building during the ventilating process. In exterior the building will be treated in brick and terra cotta entirely, and no stone will be used in its construction above the grade level. The pressed brick to be used will be mottled brick of a dark straw color, and the trimmings will be of a light buff color. It is the intention of the company to have the building completed and ready for use by December 1.

INDEPENDENTS SEEK OMAHA FRANCHISE.

Active measures have been taken before the city council of Omaha by the Independent telephone companies to secure a franchise in that city. Blackburn & Spurlock, attorneys, presented the matter to the council in a signed communication. The new company asks for a franchise for twenty-five years. Plans and specifications will be filed immediately after the franchise is granted and work is to begin within three months. Within twelve months an exchange of 2,500 subscribers will be built. The maximum charge for business telephones is to be $3 per month and for residence $1.75 per month. The company furnishes the city with such telephones as it needs free and will pay a royalty of 3 per cent on the gross receipts. A good and sufficient bond to keep all promises and make good all damages will be filed and in addition $1,000 in cash will be deposited with the city treasurer to further make good. It is assured that the men making this proposition are builders, not promoters, and that if given a franchise the company will not sell out to any company now doing business in Omaha.

In its fight against the entrance of the Independents into Omaha the Bell company is being ably assisted by the city council, the Omaha *Bee* (Col. Rosewater's paper) and several other newspapers of that city, but in spite of this strong opposition it is believed that the city council will be forced to grant a franchise to the Independents.

In addition to the application already made for a twenty-five-year telephone franchise by Victor Stephens of Dubuque, two and possibly three other groups of capitalists may present similar requests. One, a local organization, of which E. E. Bruce and F. P. Kuykendall are the head; another, the interests centered in the system of Independent lines converging at Plattsmouth, of which Tom Parmele of that city is leader, and the third, the men interested in the Independent Telephone Company of Lincoln, headed by Col. Frank Bill of Fairbury.

Telephoning On a Ray of Light

MATTHEW C. SMYTHE.

IMAGINE holding a conversation along a ray of light! The possibility of such a feat seems far more romantic and wonderful than does telegraphing or telephoning along the wires now so commonly used, or even by the wireless transmission of electrical impulses through space. Yet such is the latest electrical achievement offered to the public by electricians. Citizens of New York, Chicago and others of the big cities will be given the opportunity this summer to exchange ideas with their friends from one side of the city to the other, with no other medium to convey their conversation than ordinary telephone instruments stationed at different points and connected by a ray of light. For instance, in New York a beam of light will be thrown from the Statue of Liberty to the Flatiron building, and if the dazzling glow of a searchlight should be seen by Gothamites transmitting its rays between these two points, remember that it may be the pathway for the transmission of every shade of emphasis and inflection in the spoken sentence, every note of instrument music, every tone of the voice of the vocalist.

Since Alexander Graham Bell and Elisha Gray, years ago, demonstrated the possibility of making heat and light waves the agency for the transmission of human speech, the process has been so elaborated and improved upon that to-day many things are possible which to have mentioned to a man twenty-five years ago would have given him sufficient reasons for doubting the speaker's sanity.

The radiophone is the name given to the apparatus which embodies the perfection of the ideas of Professor Bell and Dr. Gray and the demonstration of the possibilities of this new instrument is a part of the telephone exhibit at the St. Louis world's fair.

Telephoning without the use of wires can be accomplished by the action of heat and light upon certain substances. Years ago Professor Bell demonstrated that lamp black, blackened vegetable fiber or similar substances, under the influence of the slightest variation of the degree of heat to which they were subjected, by changing the temperature of the air around them caused them to expand and contract. His process was to place a bit of lamp black in a small glass bulb, from which small rubber tubes connected with armpieces of the kind made familiar by the graphophone. A beam of light was employed to subject the lamp black to the action of the heat.

The next step was to cause variations in the light waves by the sound of the voice. To secure this result, the beam was first thrown against a mirror and then, by deflection, upon the bulb. Back of the mirror, which was very thin, a mouthpiece was placed in such a way that the words spoken into it caused the mirror to vibrate in accord with the impact of the sound waves. Each vibration in the mirror caused a fluctuation in the beam of light and thus a variation in the degree of heat to which the lamp black was subjected. As the heat waves increased and diminished, the lamp black caused vibrations in the column of air in the tubes, these vibrations exactly corresponding to the sound waves set in motion by the voice of the speaker. With this apparatus it was possible to hear with reasonable distinctness what was said by a speaker four hundred feet away.

Years after this demonstration by Bell, another electrician conducted an exhaustive series of experiments with a view to perfecting the process which had already been used, and in these experiments it was discovered that when a telephone circuit is superimposed upon the circuit of an arc electric light the light waves are so modified by the words spoken over the telephone that, in conjunction with the great power in the current of the arc, speech may be transmitted for distances which hitherto had been regarded as outside the bounds of reason.

When one is introduced to the apparatus with which these wonders are performed it really looks very simple. There is a searchlight of the kind used on vessels. The telephone current is derived from the lighting current by connecting the transmitter to the arc circuit, the wires being attached to the carbons of the lamp. When nobody is speaking into the transmitter the amount of air drawn from the lighting circuit is a constant one, and there is no fluctuation in the beam of light. When the telephone is in use the amount of the current drawn off constantly varies, and there is a corresponding variation in the intensity of the rays of the lamp. Standing by the searchlight it is, of course, impossible to see in the beam of light the fluctuations due to the infinitesimal changes which mark and transmit the utterance of consonants and vowels, which picture with the accuracy of photography the varying inflections of the voice and reproduce the characteristic tones of the voices of different persons. If, however, the ray of light is photographed, in place of the broad band of uniform blackness which a steady light would make upon the plate, it is seen that this one is full of slight variations in density, denoting the passage of the words which have traveled over the ray.

This much will do for the starting off of the message, which for purposes of illustration is, say, on the top of the Statue of Liberty. Then walk over to the Flatiron building, where is stationed the receiver for the message. Here should be located a parabolic mirror to collect the rays of light and bring them to a focus, upon a little glass bulb no larger than the vial in which physicians carry their sugar-coated pills. This bulb is composed of a bit of selenium, which in the recent experiments has been substituted for lamp black and other substances used in the original discovery. This substance, selenium, is very sensitive to the action of light. Little threadlike wires are wound round this tiny glass bulb, and after being brought through the glass they are attached to the telephone circuit. This is the contrivance which picks up the words spoken into the transmitter on the Statue and carried along on the ray of light and reproduces them in the receiver in the Flatiron building in the same voice in which they were spoken. And thus you have held a conversation over telephones, one at the Statue of Liberty and the other at the Flatiron building, with nothing to connect them but a ray of light.

I have been asked if I think this method of telephoning on a ray of light will ever prove to be of any commercial value. My reply is that while the invention is yet in its infancy, I think its use will prove to be both practical and very common within a very few years. I further believe that telephoning on the ocean by means of the radiophone, along the beams of the searchlight will prove to be more commonly and more satisfactorily, used than will wireless telegraphy. For instance: The captain of a ship, sitting in his own cabin, may talk with the captain of another vessel a mile or so away and receive replies, the messages traveling back and forth in the dazzling beams of the searchlights on the bridges of the ships. In fact, wherever there is a powerful electric light and the necessary telephone apparatus, I think it will be possible to talk over long distances, without the use of wires, with entire satisfaction. In replying to the message, all the captain of the second vessel has to do is to send his answer on the rays of his own searchlight, to be reproduced

in the receiver of the first ship. The reader may ask if it will be possible to keep a searchlight trained on the mirror on another vessel, perhaps a mile away, especially if the vessels are rolling in the open sea. If you have ever watched searchlight practice you have noted how even a small object floating on the waves is followed after the light has once picked it up. Not all good marksmanship on a man-of-war comes from the burning of powder. The man behind the searchlight may aim as true as the man behind the gun.

Another suggestion which has been made is that music may be transmitted by use of the radiophone. If, for example, a military band should play a march in an electric-light station, anybody in the vicinity could listen to the music, provided he had access to an incandescent lamp connected with the system. It would be merely a matter of bringing a telephone transmitter into connection with the generating machinery at the lighting station in substantially the same manner in which it is connected with the searchlight. When given such connection every note played by the band would cause a fluctuation in the electric current that could be felt in every arc and incandescent lamp in the circuit. All one would have to do would be to establish a selenium cell near one of the lights, attach a telephone instrument and listen to the music. The mysterious metal responds to the changes in the current in so wonderful a fashion and with such sensitiveness that every sound is conveyed faithfully, regardless of the intervals between sounds. During recent experiments in Boston calls played upon a bugle near an arc light were heard distinctly over the rays at a distance of several hundred feet.

Perhaps another matter suggests itself. Naturally a searchlight is used for ordinary purposes only at night. Can sound be transmitted over its rays when the sun is shining at noon-day? It can be and is, for the rays of the electric light go straight to the mark just as by the use of the heliograph, a ray of sunlight is made to spell out messages. It is fog, not sunlight, which makes it impossible to talk over the light rays.

The possibilities of the radiophone, when once the instrument is thoroughly completed and perfected, seem to be truly wonderful. Although at the present time it possesses absolutely no commercial value, still it seems that in a short time it may become very valuable. At the first American world's fair in 1876 there was on exhibit a scientific novelty which at that time was also thought to be of absolutely no practical use. That exhibit was the original telephone. Now, less than thirty years afterward, realizing how vastly important the telephone has become and how universal is its daily use, the most skeptical must hesitate long and study hard before making the declaration that the radiophone, this interesting and fascinating development of one of Mr. Bell's pet ideas years ago, is of interest merely as a device for amusement. On the other hand, it may be confidently expected that wonderfully marvelous possibilities are in store for the radiophone, for truly it may prove to be one of the great inventions of the age.

"ENSLAVEMENT OR FREEDOM."

A modest little pamphlet with the above caption drifted into the TELEPHONY office a few days ago unheralded, unsigned and in a perfectly plain envelope, leaving the name of the author, as well as the sender, shrouded in mystery. Its treatment of the telephone subject is so pointed, and withal it is so clever that we take pleasure in publishing it in full, only regretting that we cannot give credit where credit is due:

Only one American home out of every five has even a single servant. Eighty-two out of every hundred homes have no servants. The 82 per cent may be free from the exasperating annoyances that vex and worry the patience of the 18 per cent, but the latter are free from much of the manual labor that will dishearten and even enslave the former if every modern convenience that facilitates rapid, systematic work in the home is not utilized. Enforced slavery is prohibited by constitution and statute. Voluntary slavery is abhorrent to the progressive mind.

As the Liberty Bell in Independence Hall symbolizes the freedom of the nation and of the individual, so a telephone bell is justly defined as the liberty bell of the household, bringing to every member freedom through the saving of time, the saving of labor and the saving of worry. And as the freedom proclaimed throughout the land by the Liberty Bell increased the efficiency of the nation, so a telephone bell in the home increases the efficiency of the housekeeper through bringing freedom from wearying, disheartening details that often rob her of valuable time and of more precious strength rightfully hers to use for personal advancement or restful enjoyment.

All during his working hours the husband has a telephone at his elbow, no matter how many employes he has. For it saves much time, a thousand steps, a score of letters, a dozen calls. It largely increases his efficiency, enables him to achieve much that he plans, aids him in his ambition to be a leader in his chosen calling.

Why not let a telephone prove as serviceable to the wife, the housekeeper, the homemaker, the mother of future homemakers? Why not let its power to aid in accomplishment serve to stimulate the wife, the mother, into achievements that make life worth the living? Why not let it save time that may be better devoted to cultivating the acquaintance of husband and children, and in studying the moods and the needs of the former and in forming the character of the latter?

Granted that the husband's mother never enjoyed the helpful service of a telephone in her home. Neither did the husband's father enjoy many of the labor-saving devices that are now so helpful in promoting profitable progress. A generation ago the telephone was unknown. Housewives formerly spent much time in weaving and spinning, in candlemaking and soapmaking, though none of these pursuits is now thought suitable or profitable for home work in our cities. After the same fashion, business men formerly wrote their letters in long hand and kept their accounts in single entry as best they could, blackened the stove and cleaned the windows. Yet the complexities of life, both in the home and in the store, in the office and in the mill, the bitter competition that faces the husband on every hand, and the demands that society make on the wife, and that the children make on the mother, are such that methods satisfactory a generation ago must give way to up-to-date, helpful, time-saving devices.

For years the telephone has gradually modified commercial, industrial and professional methods, and these changed conditions make the business world accept the telephone at its true value. Telephone service has never failed to prove just as helpful a function in the household as in the office.

QUEER AND INTERESTING OLD ADVERTISEMENT.

Only a dozen years after Benjamin Franklin's famous discovery with the use of a kite that lightning is electricity, this advertisement appeared in the Massachusetts *Gazette,* March 7, 1765. What were these "entertaining experiments" offered to the people of Boston "at one Pistareen a Lecture" by David Mason?

A COURSE OF EXPERIMENTS
ON THE

newly discovered *Electrical Fire,* to be accompanied with methodical LECTURES on the Nature and Properties of that wonderful Element will be exhibited by DAVID MASON, at his House opposite Mr. *Thomas Jackson;* Distiller, near Sudbury-Street.—To consist of two Lectures, at one Pistareen each Lecture.—The first Lectures to be on Monday and Thursday, and the Second on Tuesday and Friday Evenings every week, Weather permitting.

OF ELECTRICITY in general

That the Electric Fire is a real Element,—That our Bodies at all Times contain enough of it to set an House on Fire,—That this Fire will live in Water,—A Representative of the seven Planets, shewing a probable Cause of their keeping their due Distances from each other, and the Sun in the Centre,—The Salute repulsed by the Ladies Fire, or Fire darting from a Lady's Lips, so that she may defy any Person to salute her,—A Battery of Eleven Guns discharged by the Electric Spark, after it has passed through eight Feet of Water,—Several Experiments shewing that the Electric Fire and Lightning are the same, and the Points will draw off the Fire so as to prevent the Stroke,—With a number of other entertaining Experiments, too many to be inserted in an Advertisement.

TICKETS to be had either at his House above or at his Shop in Queen-Street.

Some of the most astute antiquaries at Boston have been making a search for further information respecting the above, since the advertisement was resurrected a short time ago from the files of the Massachusetts *Gazette,* but thus far they have been unable to furnish any further information on the subject.

The Telephone in Court Circles

RANDALL & COMPANY of Gibbon, Nebraska, are evidently of the opinion that the telephone is a modern business necessity, and they do not propose to be without one in their place of business, if there is any lawful way to accomplish such a thing. Before Judge Hostetler the above named firm applied for an injunction to prevent the Farmers' Home Telephone Company from removing its telephone from plaintiff's store; from disconnecting the plaintiff from its telephone system and from depriving plaintiff of the full use and benefit of said telephone and telephone system. The petition recites that plaintiff has had the telephone in question in its store for about two years and has always paid in accordance with the terms of agreement for the use of said telephone and service and is willing to continue to do so. Notwithstanding this, defendant has notified plaintiff that it will no longer allow him to use its telephone in his store and will remove same. Upon plaintiff giving bond in the sum of $100, Judge Hostetler issued a restraining order, the hearing upon the same being set for September 12. It is said that the threat of the manager of the defendant company to remove the telephone from the store of the plaintiff was caused by the alleged violation of the company's rule upon the part of Randall & Company, in allowing non-subscribers to use their telephone.

In the district court of Salt Lake City recently the Rocky Mountain Bell Telephone Company filed a complaint against the Utah Independent Telephone Company, alleging fraud on the part of defendant in using the same numbers for its telephones as those adopted by the plaintiff. The numbers objected to are those used by defendant in its various business departments, it being alleged that the use of said numbers has occasioned plaintiff no end of trouble and annoyance, and put them to a great deal of unnecessary expense.

The Independent people declare that the suit is only an effort on the part of the Bell company to stifle competition. Says Manager Jones: "They realize that we are giving better service, and are using every means in their power to retain their dwindling business. It is ridiculous to suppose that they will win the suit, but on the contrary it will redound to the benefit of the Independent company. We do not fear the result. The Bell company has no copyright on the telephone numbers and cannot keep us from using them if we so desire."

Judge Hall ordered the defendants to appear and show cause why an injunction should not be granted preventing the use of the numbers complained of. A demurrer was entered by the defendants, which was sustained by Judge Hall on the ground that the complaint did not set forth what loss would result to the plaintiff in case the Utah Independent Company did use its telephone numbers. The court granted the Bell Telephone Company ten days in which to amend its complaint.

Two recent decisions of the Superior court of Pennsylvania on the right and duties of telephone and telegraph companies will be read with great interest by the public. In brief the decisions hold that if the employes of a company mutilate trees on private property the company may be made to pay for their destruction and any man who finds wires placed on his house without permission may cut them if he chooses. In these two Superior court decisions referred to it is emphatically laid down that a telephone or telegraph company can have no right whatever on private property except what the owners grant them. They do not possess the right of eminent domain, except on the public highway. In the country, according to these decisions, a wire strung along a highway is an additional servitude on that highway for which the owner of the fee, that is the abutting property owner, is entitled to compensation. In other words, the telephone and telegraph companies must obtain permission of the land owner before occupying private land, and though they may occupy a public highway in the country without permission, they must make a just compensation to the abutting property owner.

Justice White, after hearing a further appeal on the subject, in the Supreme court in Brooklyn, granted a peremptory writ of mandamus directing the New York Telephone Company to restore its service to the New York & New Jersey Distributing & Circulating Company. This is the news distributing bureau with offices in the Park Row Building which was raided as a poolroom exchange by Inspector Schmittberger last May, the inspector acting under instructions from Police Commissioner McAdoo. The poolroom interests take the decision of Justice White to mean a complete victory. Counsel for the distributing and circulating company immediately took the necessary legal steps and before the day was over the telephone instruments in the offices of their clients, which had not been working since the day of the raid, were connected and the concern was in precisely the same shape as it was before the police swooped down upon it. It will be remembered that but recently a contrary decision was rendered in another court.

The Supreme court of Ohio, at Columbus, has decided that the city of Findlay cannot prevent the Home Telephone Company from raising tolls. This decision may mean that Toledo, Ohio, will lose in the quo-warranto proceedings begun in the Supreme court against the local Home Telephone Company, to stop it from raising charges to subscribers. There is a difference in the two cases, however, and the city department has not given up hope that a favorable decision will be rendered. In the Findlay matter the franchise was granted by the city council, in Toledo it was given by the probate judge after the city and the company failed to agree as to terms. The Findlay case came up from the Circuit court of Hancock county to the Supreme court, while the Toledo case went direct to Supreme court with the beginning of its action in quo-warranto.

Laura A. Lynch and her infant son of Ogden, Utah, have commenced action against the Utah Independent Telephone Company for $50,000 damages. Edgar F. Lynch, the husband and father, was employed by the company with a construction gang erecting poles in Ogden. On May 28 a pole being put up fell and, striking Lynch on the head, inflicted injuries from which he died the same day. Negligence on the part of the company is alleged in not furnishing safer equipment for the construction work and in not digging its post holes deep enough to prevent a pole from falling in the manner alleged. The deceased had been in the employ of the company only two days when the fatality occurred.

The case of the Winnebago County (Ill.) Telephone Company against Albert Rice was argued before Justice Slagle of Rockford. It was a trial by jury and the case was decided in favor of the telephone company, which was awarded damages to the amount of $40. Mr. Rice is a building mover and was engaged to move a barn for P. Byron

Thomas, who lives about a mile east of Rockford on the Guilford road. Along this road run six wires of the telephone company. In moving the barn from the yard to the street Mr. Rice instructed some of his help to cut the wires and the barn was safely landed in the roadway. The result was the suit for the recovery of $200 damages by the company. It took the jury about fifteen minutes to decide in favor of the plaintiff.

Floyd L. Shigley, a lineman for the Duluth (Minn.) Telephone Company, was electrocuted recently while at work on a pole. The telephone and electric light companies both used the same pole in this instance. The telephone wires were strung on the lower cross arm and the electric light wires on the upper arms. A bare live wire was looped down from the second cross arm to within eighteen inches of the telephone cross arm, and with this Shigley came in contact. Louis Shigley of Fairmont, Minn., the dead young man's father, has sued the two companies for $5,000 damages.

Through its attorney, C. Bentley Matthews, the Queen City Telephone Company of Cincinnati appeared before Judge Littleford and successfully argued a motion for an early hearing on error from the Probate court. Mr. Matthews insists that his company is entitled to a hearing out of regular order and immediately because of the large interests involved and by reason of the fact that these interests are tied up until the questions involved can be got through the lower courts to the highest tribunal of the state. He was opposed by Attorneys Hunt for the city and Outcalt for the Cincinnati Bell Telephone Company.

A peremptory order was granted by Justice White of the Supreme court, Brooklyn, directing the New York Telephone Company to restore its service to the New York and New Jersey Distributing and Circulating Company, the concern whose offices were raided last May by the police. The telephone instruments, which were torn out of the offices, were replevined after the raid, but the telephone company refused to restore the service on the ground that the distributing concern was supplying news to pool rooms and violating the laws.

The council of Duluth, Minnesota, has passed a new ordinance requiring telephone companies to remove their wires for the passage of buildings being moved from one location to another. It is intended to get a legal ruling upon the matter at the earliest date. Eastern courts have held that house-moving is not an ordinary use of streets, but it is contended that in a new country where house-moving is more common, the same conclusion would not necessarily apply. The Minnesota Supreme court has not acted upon the point.

The Supreme court of Kentucky has decided that a telephone company which negligently stretches a wire over the roof of a store porch without adequate insulation owes no duty to a passerby who takes refuge under the roof from a rainstorm, and therefore is not liable for his death in case lightning is conducted by the wire to the roof and kills him in reaching the ground.

The Farmers' Telephone Company of Hopedale, Illinois, secured an injunction through the Circuit court restraining the Pekin Telephone Company from refusing to give them connection with the Pekin exchange. The Pekin company is now endeavoring to have the injunction dissolved, and the case has been referred to H. P. Jones, special master.

The C., B. & Q. railroad, by O. A. Abbott, Sr., and ex-Senator Manderson, attorneys, has filed a petition in the district court against the Grand Island (Neb.) Telephone Company, restraining the latter from building its lines above, over or across the railroad, with its telegraph wires, and temporary injunction has been granted. The railroad company claims it would be detrimental to both companies and requested the telephone company to put its wires under ground.

J. F. Cary, a merchandise broker of Birmingham, Alabama, has filed a novel suit in the Circuit court against the Southern Bell Telephone & Telegraph Company, for $1,999. He asks this amount of damages, claiming that on November 15, 1903, the defendant published a telephone directory, as was its custom at certain intervals, and failed to give his name as a subscriber. The plaintiff says that he was a subscriber, and his business was damaged by the absence of his name, to the amount asked for.

F. C. Smith, president of the Commercial Telephone Company of San Antonio, Texas, for which a receiver has been asked, has filed application for receiver in Judge Camps' court. The petitioner says he believes a combination of bondholders is seeking to absorb the properties by premature foreclosure and that suit was filed with that end in view. He asks that the receiver he seeks, under orders of court, bring suit to cancel alleged unlawful bonds and, if necessary, sale be made under orderly foreclosure.

Vindication and five cents in damages were awarded in Chicago by Justice Hurley to Constable Small, the defendant in the constable's suit being the Chicago Telephone Company. Small sued because he had dropped a nickel in a slot telephone and then had been unable to get either his "party" or the return of his money. To make matters worse, he explained, the telephone girl giggled at him in an offensive way.

The prayer in the petition filed by the Ohio Telephone and Telegraph Company against Chauncey M. Graham of Columbus, Ohio, was allowed by Judge Bigger. The defendant, by the order of the court, was enjoined from interfering in any way to prevent the company from cutting trees on his premises or from stringing wires over his premises.

C. E. Burgess, of Grand Forks, North Dakota, one of the stockholders of the North Dakota Telephone Company, seeks to have the affairs of the corporation wound up and a receiver appointed on the grounds that the telephone line has been converted into a telegraph line almost to the exclusion of the telephone business.

The Kentucky Court of Appeals has dissolved the temporary injunction recently obtained against Sol. P. Kineon and others to prevent them from building telephone lines through Kenton county to connect their system with Cincinnati. This is considered a victory for Independents in that county.

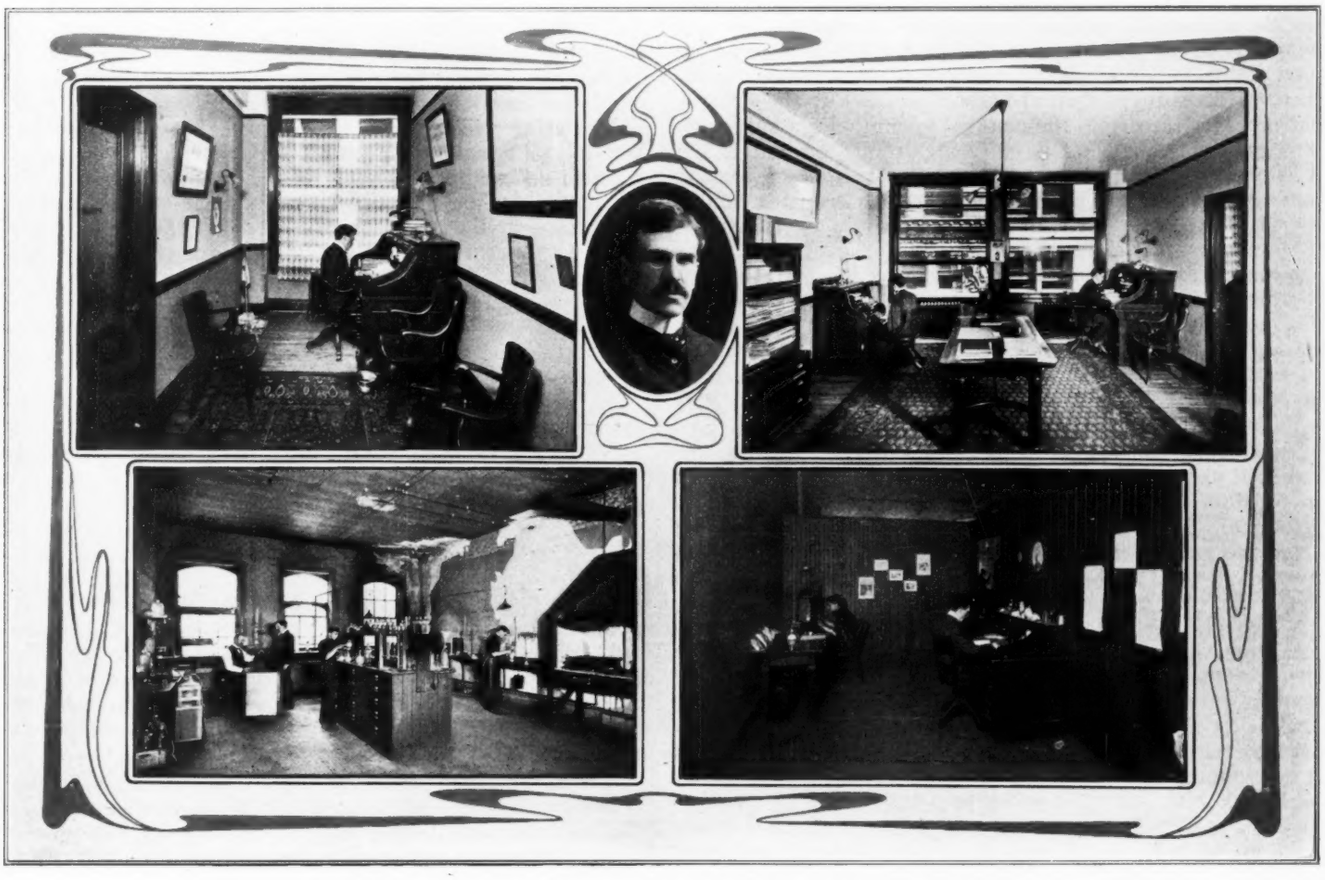
The Martin Telephone Company of Webster City, Iowa, has served notice of a suit for $1,000 damages against the Stratford Independent Telephone Company; $500 damages is alleged to be due on a breach of contract and $500 exemplary damages claimed.

The Northwestern Telephone Exchange Company of Minneapolis has begun suit to enjoin the Tri-State Company from interfering with its Winona, Minnetonka and Willmar line, and Judge Elliott of Minneapolis has issued a temporary restraining order.

The decision of Probate Judge Dugan of Ohio in the case of the Central Union Telephone Company vs. the incorporated village of Celina, Ohio, practically shuts the Central Union Company out and is most satisfactory to the home company.

Testing Raw and Finished Material

QUALITY in the finished product is only maintained by eternal vigilance. If the producer desires to turn out the best product, it is very necessary that frequent and continued testing be employed in order to determine that the quality is up to the standard all the time. Money is well invested in tests, if the manufacturer determines to build his trade on the firm foundation of quality, and hopes to excel in his line. It will be found upon investigation that the manufacturer turning out goods of the highest quality pays liberally for testing. One corporation claims to spend one-tenth of its labor cost on inspection and tests so that its product has not only a very high value, but its sales exceed the output of any three of its competitors. It is easier to sell a good article than a poor one.



LABORATORY AND GENERAL OFFICES OF H. M. DEAVITT, CHICAGO.

The larger manufacturers have well equipped laboratories for this purpose, but often find it to their advantage to use the outside laboratories to check results.

The great value of laboratory tests to a manufacturer is to be able to present authoritative and reliable information concerning the quality of his goods, this information being more convincing to the purchaser if made by a disinterested third party. These tests should be made impartially and accurately, the demand being for cold-blooded tests made by disinterested experts, who care only for facts accurately determined. Experience has proven that careful buyers who test everything obtain better goods for the same money than careless purchasers who buy on faith without tests.

The Pennsylvania Railway company maintains an extensive laboratory at Altoona, Pennsylvania, where everything pertaining to its equipment and supplies is put through rigid tests. If such continuous testing did not pay well for the expense and effort entailed the company would have discontinued it years ago. To-day you cannot sell that company a barrel of oil, a car axle or a boiler plate at any price unless it passes their tests. The result of this thorough inspection is that they receive only the cream selected from the best, for anything that does not meet their specifications is promptly rejected.

The United States Navy Department, especially the bureau of equipment, buys all its material under rigid specifications. Many a manufacturer has learned a hard lesson by accepting contracts under the impression that the specifications were simply government "red tape," or with the idea born of self-conceit that his product was "all right" and required no testing before being submitted to make sure it would comply with the specifications. Many thousands of dollars worth of wire cable, fuses, conduits, lamps, supplies and electrical apparatus are rejected every year by the navy department as a result of their tests, for failure to conform with their specifications. The cost of transportation alone of the rejected material in many cases, aside from the money loss, would have paid for proper tests.

It is a question as to what is done with this rejected material, and it can be taken for granted that it does not always go into the manufacturers' scrap heap. Perhaps somebody who does not test may get it at what looks like a bargain at first, but very costly in the end.

The value and importance of testing is shown from the experience of the larger manufacturers, and is the reason for the equipment of and maintaining of these laboratories as illustrated herewith. The illustrations show the laboratory and general offices of H. M. Deavitt, the leading chemist of Chicago, who does the analytical work for the larger telephone manufacturers, as well as some of the most prominent corporations in the west. Mr. Deavitt employs skilled experts and is in a position to make tests for the exclusive use of his patrons at a very reasonable cost. The advantage which these laboratories have for the manufacturer over an equipment of his own is that he pays here for simply the work done, and has no constant tax for maintenance. These laboratories make a specialty of analytical work necessary for the successful manufacture of the telephone. Experts who have spent years in this branch of business are making tests daily of all kinds of material used in their manufacture. Because of the experience acquired by the experts, patrons can learn from the material submitted not only what it is made of, but what is more important, to what extent it is suitable for the purpose intended. It is obvious to most people who use the telephone that it is an instrument which, if one part is defective, the whole instrument is useless. For this reason the manufacturer must exert every precaution to see that material selected is the best and that the design and workmanship are first-class in every respect. The construction and material used in the telephone are so closely related to the finished product that it is interesting to note the reason why one instrument is excellent, while another, to the naked eye its exact duplicate, but made from a different shipment of material, does not work at all.

Sometimes the magnet generators will not ring over the required distance. It may be that it is of a poor design, but more often it is due to the poor magnets used in its construction. This may be from the fact that the magnet steel was not of the right composition, or that it was not properly treated in the operation of making permanent magnets. In the process of making steel it is impossible to get two different lots which have exactly the same chemical composition, variations being caused by a difference in the ore, fuel, and the working of the furnace used in the manufacture. Consequently, in order to get continuous shipments of steel suitable for making magnets, it is necessary to select heats, the chemical analysis of which shows it to contain elements with percentages within the limits which experts have shown to be adapted for making the best magnets. It is necessary that the consumer should have an analysis of the steel made as soon as the shipment arrives to see that it meets specifications, as the steel manufacturer does not appreciate what effect a slight variation in chemical composition may make in its electrical properties. He does not consider the fact that the carbon and manganese are the hardening elements, and that the harder the steel becomes on tempering, the more permanent are the magnets made therefrom. He does not delay shipment because the steel in stock contains more sulphur than it should, rendering it almost certain to crack when heated. He does not stop if the steel contains such a high percentage of phosphorous as to make weak magnets. For this reason the up-to-date consumers are not willing to use the steel until they have had their own expert make an analysis of it, as the material received may be that which has been rejected by other users as not being up to specifications, or it may have been shipped from stock, without regard to whether it was adapted to the purpose or not.

Like most of the material used in the telephone, the cost of magnet steel is very small compared with the amount of labor performed upon it in making it into a finished instrument, so that the inspection of the raw material should be rigid to save useless labor upon a product which would afterwards have to be thrown away. In the telephone each part must do its own work, and if the material used does not give the results expected after receiving its proper treatment it is apt to render the whole instrument useless.

Norway iron used in telephone construction has been the cause of much trouble when the proper quality was not used. Like magnet steel Norway iron is absolutely useless for this work if it varies in its chemical composition beyond certain limits, but unlike magnet steel, it must have no magnetic qualities. It must be the very softest iron, capable of being magnetized instantaneously, and having the quality of giving up its magnetism immediately upon shutting off the current. Consequently this iron must have the least possible percentages of the hardening elements, namely, carbon and manganese.

Paraffine wax finds various uses in the telephone for insulating purposes, and experiment has shown that the higher the melting point the harder the wax and less apt to absorb moisture, hence a better insulator.

Insulating telephone cables requires the greatest care not only in selecting the proper materials, but in the workmanship as well. The very best copper wire with a high conductivity should be used, and special attention should be taken that the paper used in wrapping is pure, that the metal sheath surrounding it has the right chemical composition, so that it will resist the corroding elements when buried in the earth.

Some of the material used in the telephone is expensive, and it is excellent economy to make sure that the quality is up to the standard.

Italian tram silk used in insulating magnet wire is very expensive, selling from $8 to $9 per pound. This material may vary greatly in the number of yards to the pound. The consumer should see that he gets as many yards to the pound as possible, for the greater number of yards, the more feet of wire can be insulated, therefore, the cost per foot of wire for insulating would be less according to the yards of silk per pound. Presuming that the material runs 900 yards to the drahm, which it should do, if the wire manufacturer receives silk which runs only 700 yards, he only gets seven-ninths of what he should have, and when it is taken into consideration that some concerns receive as much as 500 pounds daily, amounting in value to over $4,000, the question of cost in testing is not to be considered.

There are other insulated wires used containing insulation less expensive and made in much larger quantities, and the material here used is also carefully tested.

Hard rubber is an expensive material used in various parts of the telephone for insulating, being found in the mouthpiece of the telephone, the outside shell of the receiver, rods and sheet used in the manufacture of switchboards, etc. This material should be carefully tested to see that it contains no shoddy or hard mineral filling, for although it greatly cheapens its cost to the manufacturer, yet the product is nearly useless and entirely unfit for the purpose intended.

The above are only a few of the materials which are carefully tested before being used, but if a telephone were taken apart it would be found that each part of it has been carefully tested before being put together.

If one manufacturer is not producing as high a grade of goods as another he should know wherein his fault lies, and the only way is to test until the weak spot is discovered, and then apply the remedy that will bring his goods up to the highest standard. When this point has been reached instead of slipping back testing should be continued so that others may not pass him in the race for superiority.

The Adams-Randall Telephone Apparatus

WE HAVE before us a pamphlet, on "Something New in Telephony," issued by the Adams-Randall Telegraph and Telephone Supply Company of New York city. It refers to recent inventions of C. Adams-Randall in telephony. From inquiries we have made and facts obtained by us, it would seem that the above title is a correct one, and we think that information on the subject will prove of interest to our readers.

In an interview recently had with Mr. Adams-Randall by a representative of TELEPHONY he said:

"From actual tests made it has been shown that these inventions constitute, without doubt, the greatest advance in telephony since the battery transmitter superseded the magneto. I am convinced that these inventions will produce a radical change and advance in telephony, especially as applied to long distance working, and simultaneous telegraphy and telephony over and upon the same circuit, be it metallic or grounded, and possibly, as some think, solve the problem of wireless telephony, for the reason that there seems to be no limit to the initial energy which can be carried and varied by the transmitter without detriment to the same, the

J. ADAMS-RANDALL.

G. C. R. MARSHALL.

limit being restricted only to the number of parts, fractions, subdivisions or independent contacts that can be used in combination with a single vibrator or diaphragm, without unduly dampening, limiting or distorting its vibrations. (See Prof. S. P. Thompson's report).

"Transmitters having thirty-two independent contacts have been used, giving an initial current of thirty-two watts in the primary circuit of the transformer, without heating or affecting the same detrimentally, and without distorting the articulation. This certainly in the practice of the telephone is fundamentally new, and may, indeed, revolutionize its use.

"It is well known to all engaged in the telephone field, that all present telephone transmitters are strictly limited in their output of initial current energy, the maximum amount that can be commercially and practically used being that derived from a few cells of battery, and therefore long distance telephony, with the best granular transmitters, is only possible now by lowering the resistance of the circuits by constructing them of low resistance, expensive, heavy copper wire, such circuits being also double or metallic, ungrounded circuits, and 'transposed,' to overcome the detrimental effects of induction and self-induction, and constructed with greatest care and expense, to prevent loss by leakage; in other words, to-day circuits are constructed and adapted to suit the transmitter, instead of constructing and adapting the apparatus to suit the circuits, as in telegraphy, and as done with the Adams-Randall telephone, under which invention, having a large initial output, there remains a sufficient margin of current to actuate the receiver, after overcoming the resistance of distance, loss from leakage and the neutralizing effects of induction and self-induction of the circuit."

We take pleasure in presenting our readers a reproduction of an article by Mr. Adams-Randall on the subject of telephony, and upon the results obtained with the Adams-Randall apparatus, with reports thereon, which appear in the proceedings of the Association of Railway Telegraph Superintendents, at their annual meeting held at New Orleans in May, 1903. The article is as follows:

Mr. President:

Through the courtesy of one of the members of your association, I have had the pleasure to-day of listening to the discussions and remarks on the subject of "Composite Transmission," or simultaneous telegraphy and telephony over and upon single wire grounded and metallic circuits.

The subject is of great interest to me, and one to which I have given much thought, time and experimenting, and am much pleased to take advantage of the opportunity you have so kindly afforded me of placing before your members by means of this paper my views on the subject and some of my experiences in connection with experiments, tests and work in this direction, hoping the same will be of interest and use to your association.

In my humble opinion, this branch of inter-communication should be of greatest interest to railroad telegraph superintendents and managers, and I have noted with pleasure the tenor of the remarks and the spirit shown by some of your members, as the same seem to emphatically endorse my opinion.

Your secretary, Mr. Drew, brings the importance of this system of line working prominently to the front; substantially as follows: "We want it, we must have it, we are going to have it or know why we cannot." This is to the point and plain and business like.

In carrying out composite transmission there are many difficulties to be overcome, especially on or upon single wire grounded circuits, but I know that they are not insurmountable, as I will hereafter explain and can demonstrate.

Undoubtedly it will be admitted that the greatest source of trouble is that of induction from adjacent lines, especially on grounded circuits. I have no hesitation whatever in stating, and based on actual experience, that on grounded circuits of at least 150 to 200 miles in length, erected on a common pole line carrying other grounded circuits, the troubles from induction, self-induction and earth currents can be and have been met and overcome, and also as well upon transposed metallic circuits of 1,000 miles or thereabouts, and telephonic messages, under such conditions, transmitted as clearly and commercially as upon the greatest majority of the commercial telephone lines in general use. I will later on state how and under what conditions and circuits.

I most emphatically assert that there are no electrical reasons why railroads should not be supplied with facilities for simultaneous telegraphy and telephony over and upon their existing circuits—thus doubling or trebling their values—at a reasonably low cost, certainly at a nominal expense as compared with the construction of special copper wire circuits; in fact, it may be stated to be simply a question of moderately increased cost for current energy over the cost with the present telephone—and in no case equaling the cost of current energy required for telegraphing—as against the great cost of special heavy copper wire circuits. In the first case for, say circuits of 1,000 miles, the expense can be reckoned in dollars, and in the other case must be calculated at thousands of dollars.

In this connection I quote again from the remarks of your secretary. Mr. Drew said substantially as follows—I refer to the minutes for his exact words: "We all know that the telephone is a delicate instrument. We cannot knock it about as we do the telegraph," etc.

Now, Mr. President, to my mind this gives the whole story tersely. It discloses the root of all the trouble, and why the difficulties have been so great in connection with "composite transmission." Briefly, with the telephone of to-day there is no current to do work—that is, to overcome the resistance of distance, leakage and induction (and self-induction of iron wire circuits) and then actuate non-sensitive electro magnetic receiving apparatus, as in telegraphy—and therefore heretofore it has been necessary to reduce the electric work to be done by limiting the distance or by constructing costly

low resistance copper wire circuits, and also even then employing sensitive receiving instruments to take up or respond to the attenuated working currents, which in the majority of cases is of far less energy than the induced currents from extraneous causes. This is all wrong, and now unnecessary. In telegraph practice you do not put up an expensive metallic copper circuit, because your cheap iron wire circuit has a high resistance or because the induction is heavy, but as a rule you increase your current energy and adjust your apparatus to the line conditions.

This should be and will be the plan or rule generally in telephony, and what I claim broadly is that whatever is done in manual telegraphy can be done in telephony. The question naturally arises, how? To this I answer, by simply increasing your initial output, as in telegraphy.

Telephony has advanced, and rapidly, by steps. We had first the "Bell" magneto telephone, serving to transmit and receive without a battery, then the "Blake" transmitter, with its one cell of battery at one and one-half volts, and then the present battery transmitters using three or four cells at, say six volts, and with greatly increased advantages and results. It is but a step further to a transmitter having an initial output corresponding to work to be done. To be successful on long, difficult and composite circuit work, this step must be taken and, I may say, has been taken and practically demonstrated.

You will remember that Mr. Fowle, one of our ablest telephone experts, when reading his very clear and most interesting and instructive paper on circuit construction and transposition, stated about as follows: "Under such conditions we must have less sensitive receivers and more powerful transmitters." This has been my contention for some years, and I am pleased to have my views endorsed by one so prominent in telephone work. In my opinion, this general fundamental principle is the only practicable solution of the problem of overcoming the difficulties of simultaneous transmission and of long line work. To obtain the best and most perfect use of the telephone, in conjunction with the telegraph, on any circuit, long or short, thick or thin, what we require is:

First, a transmitter that will carry and vary, or control, through a transformer, a current having approximately and as nearly as possible the same mille-amperes as required with a telegraph apparatus working the same circuit; and,

Second, electro-magnetic receivers or desensitized magneto-receivers, which can be adjusted over the induction from adjacent circuits, similarly as done with a relay.

With such an apparatus the conjoint use of the telegraph and telephone upon the same circuit will have reached, if not perfection, certainly absolutely reliable commercial use. I am not prepared to say that this stage has yet been reached for all grounded telegraph circuits or for circuits where the induction is very heavy—where undoubtedly metallic circuits will be advantageous—but very long strides have been made in this direction, and I am now using on the Illinois Central railroad lines, experimentally, a telephone transmitting apparatus employing a current in the local transmitter circuit, shown by proper volt and ammeters, many times greater than can be used by any other telephone, and I know of no reason why this current-energy may not be increased to any power required. With such a transmitting apparatus and a transformer best adapted to the circuit or circuits to be worked, there is no apparent reason why any telegraph circuit worked telegraphically direct—that is, without repeaters—may not be worked simultaneously telephonically.

As to telephone receivers, I have known of and used for some years non-sensitive receivers, made so by simply adjusting the diaphragm out of the magnetic field, thus rendering them insensitive to any degree required. I have also used receivers having interchangeable diaphragms of varying thicknesses, with which the same effect of insensitiveness is produced, but not quite so conveniently. I have also used electro-magnetic receivers—that is, receivers without a permanent magnet.

This form can be made to give the same effects of insensitiveness, and may even have a free moving or vibrating armature and adjustable spring, similarly to a relay, and without the usual confined diaphragm.

With such transmitting and receiving apparatus as above outlined it is only necessary, on grounded circuits where there are confusing induction effects, to adjust your receiver over the induction, or to that point where induction noises are not disturbing, and then employ a sufficient current energy from or through your speech transmitting apparatus to actuate the desensitized receiver.

With such apparatus I have personally worked, among others, the following circuits:

A.—Dover, England, to Fournes, Belgium.

On this circuit, at trials made by the Belgian government, all the best known telephones were tried upon the submarine telegraph cable between Dover and Fournes, some 104 miles in length metallic circuit, with about twenty miles of added iron telegraph wire.

Only the best granular telephones were audible, and that faintly, whereas, with an apparatus of the form above described, using twelve cells of Leclanche battery, the speech produced was pronounced too loud.

A most severe test was then made by coupling to the submarine cable two iron telegraph wires from Fournes to Brussels, some sixty miles, or 120-odd miles metallic circuit. At this test all the other telephones were absolutely silent, whereas with this transmitter, using twelve cells, every word spoken at Dover was heard at Brussels and repeated back.

B.—London to Dover Harbor.

This trial was made over the grounded iron wire telegraph lines of the London, Chatham and Dover Railway Company, between London and Dover Harbor, in the presence of a number of engineers and experts.

These tests were made during a busy part of the day, over an iron telegraph wire of high resistance, all of the usual telegraph instruments being left in circuit, in series, adding some 2,000 ohms extra resistance, or over 1,000 miles of the usual long distance copper circuit. This wire was upon poles with many other telegraph wires in actual use at the same time, including the Government Continental Telegraph line, on which the Hughes printing telegraph instruments were in operation, the heavy currents required with them causing, with the other telegraph instruments in use, great inductive effects, which were very noisy, most confusing and nearly deafening when listening in a Bell receiver, making this an exceedingly difficult circuit to telephone over.

With the herein described method and apparatus, however, the detrimental effects and noises from induction were entirely overcome, and speech transmitted and received without interference from induction, and with ease and reliability under all of these adverse conditions, the voices of the speakers being readily recognized. These results were accomplished with less battery than used for telegraphing. It is a matter of record that many attempts had before been made to telephone over this particular line, without getting even "hello!"

C.—London to Brighton, some sixty miles.

These tests were made during the busy part of the day over an ordinary iron wire telegraph line, using an earth return. The wire used was upon poles with some sixty-odd other wires, upon which telegraph instruments were working at the time, the induction effects therefrom making it quite impossible to hold an ordinary telephone receiver to one's ear. To overcome this it became necessary to adjust the diaphragm out of the magnetic field one-quarter of an inch, making it sixteen times more difficult to work. Under these conditions, with the transmitter then employed, conversation was carried on with perfect ease, with loud, clear, distinct receiving and absolute freedom from induction.

D.—London to Southampton, England.

This test was made over a grounded iron wire telegraph circuit, between these cities, some eighty-odd miles, the wire being used simultaneously for telegraphing. At these tests the induction and the make and break of the telegraph key was easily adjusted over, even when right up against the telegraph battery at each terminal, and speech easily, perfectly and loudly received and business transacted, and without any interference whatever between the telegraphic and telephonic transmission.

This test proved the value of composite transmission, as it at least doubled the value of the circuit and saved the cost of a special copper circuit telephone line, estimated to cost, for copper wire alone, $10,000, besides the cost of construction, a feature the members of your association should not forget.

On the Long Island railroad this telephone talked commercially over the longest ordinary grounded iron wire telegraph circuit used on that system at the same time as the telegraph was in use and without interference from or with it. The circuit was roughly 120 miles, grounded at Broadway, New York city, and Montauk Point, Long Island, and included the telegraph cable under the East river.

L. S. Wells, telegraph superintendent of the Long Island railroad, will answer all inquiries as to the tests made on his company's lines.

Tests now being made on the Illinois Central railroad prove that this telephone is the best long distance instrument, as on their longest circuit from Chicago to New Orleans, 933 miles of No. 10 copper wire with many intermediate stations bridged across and while being worked composite, telephonic conversation is successfully carried on. All other telephones tried on this circuit have failed to transmit words.

Reference can be made to G. M. Dugan, telegraph superintendent, Illinois Central railroad, Chicago.

In conclusion, Mr. President, I would say that I trust I have shown that "composite transmission," under the general fundamental principle of increased initial current-energy, in proportion to the work to be done, and with apparatus such as I have outlined, is not only possible, but has been practically demonstrated, and not a dream, but a reality.

Now when in connection with such a method and apparatus described an electro-magnetic telephone phonograph has been developed, with which all messages sent out and received can be recorded verbatim—a result that will be shortly accomplished—will not the ideal system for railroad work have been reached?

Respectfully submitting this paper for your consideration and thanking you and the members of the Railroad Telegraph Superintendants' Association for their kind courtesies, and holding myself in

readiness to furnish any further information on this subject that they may wish, so far as I am able, I am, my dear sir,

Yours very truly,

C. ADAMS-RANDALL,
17 South street, Boston, Mass.

Mr. Randall further said: "Since writing the above I have invented, patented and perfected an open circuit calling device adapted to call over any telegraph line worked without repeaters, without interference with the relays, and over long distance telephone lines. This calling apparatus is now in daily, practical use, in connection with my 'composite set,' upon a section of a long grounded iron wire circuit of one of the prominent trunk railroads, and has been used upon a long metallic circuit over which it is impossible to call with a magneto ringer. This use and application of the invention seems to prove its practicability, and that it is an important addition, in the use of the telephone, especially as applied to composite and long distance work."

Recent tests were made of the Adams-Randall "composite set" upon a long grounded iron wire telegraph circuit, on a leading trunk railroad in New York state. A report upon these tests, by S. S. Bogart, the well known electrical expert and engineer, formerly of the Western Union Telegraph Company, is given below, and also extracts from a report by Prof. Sylvanus P. Thompson of London:

New York, July 29, 1904.

Messrs. C. Adams Randall, Frank M. Randall, Dr. Rosenburg and Chas. E. Lamber.

Gentlemen:—Late in May I was requested by you to look at a composite step-up battery means of attaining additional power in a telephone transmitting system on exhibition in a Liberty street laboratory in New York. I was so well pleased with its operation that I suggested giving it a practical test on an ordinary iron telegraph wire in actual operation. This was arranged with a mutual friend, an officer of a trunk line railroad at New York, and on June 3, 1904, I found the system installed on a circuit 89 miles long over a 20-year-old iron wire of about 30 ohms resistance per mile, six relays in circuit. The connections were 24 and 48 cells of dry battery, eight batteries of six cells each or from eight to nine volts, with an amperage corresponding to the number of sections used. The eight batteries were connected by eight leads to sixteen primary coils and with sixteen leads from the primary leads to the sixteen sections of the transmitter. These were so arranged that the resistance was reduced when receiving. The results were marvelous. Each additional amount of battery applied to the transmitter brought out a correspondingly louder and more distinct voice wave. The induction on the wire was not augmented by the increased amount of battery. When the limit of the battery power had been applied to the transmitter the operator's voice could be distinctly heard all over the large room. Each of the added amounts of battery increased the volume of sound and were plainly discernible on the receiver. Taking in consideration the fact that the wire is one of several in a 7,500 foot cable near one of its terminals and is surrounded by the regular quadruplex and duplex wires of the telegraph company, it becomes apparent that the test was made under unfavorable circumstances. I am of the opinion that this system as shown me is far superior to the composite means used by the telephone company, and the patrons of that company should insist on its adoption. If they do not, there is a field for it among the railroads not under contract to the Western Union Telegraph and the Bell Telephone Companies.

I do not hesitate in stating that this system should appeal to economical railroad officials as a means by which they can at once augment their facilities without constructing additional lines, and without interference with their ordinary Morse work on the wire using their present eight and nine gauge iron wires. The telegraph companies could no doubt induce their operators to lay aside their prejudices against the telephone and gain additional facilities. The telephone companies could give their patrons a system superior to that now in use. The Keystone and other new telephone companies would make no mistake in incorporating it in their system of service.

Several of the railroad company's officers, also witnessed the trial above referred to and were impressed with the advantages of this added power means of transmission. I regret not being at liberty to mention their names and giving them the credit due for courtesies extended to me.

Yours very truly,

S. S. BOGART.
Electrical Engineer.

Extract from report by Professor Sylvanus P. Thompson, F. R. S.:

This invention consists of a combined apparatus having for its object a telephone system that can be used for speaking over greater distances than have heretofore been found practicable and over lines where ordinary telephones are rendered almost useless by the interference of neighboring telegraph and telephone lines. Whereas, in the ordinary telephonic systems a transmitting instrument, operated by a very weak battery, is employed to send a minute current to a very sensitive receiver, in the Adams-Randall telephone the transmitter is specially designed to be operated by a relatively powerful battery, and sends much stronger currents. In consequence a receiver may be used which is much less sensitive, and, which therefore, does not pick up the interfering stray sounds which so trouble the average telephonic service. It is, without exception, the most powerful transmitter that has yet been introduced. The Adams-Randall transmitter permits the use of greater battery power than has hitherto been practicable with other transmitters; it, therefore, enables speech to be transmitted on short lines more loudly, on noisy lines with greater freedom from interferences and through cables to greater distances. The Adams-Randall transmitter is distinctly an advance upon the best yet in the market, the Deckert; for as the above tests show the Deckert is about equal in power to one of the four circuits of the Adams-Randall, but there is no apparent reason why the Adams-Randall should not be made with six, eight or ten circuits with proportionate increase in power.

We understand that installations are also to be made upon several other prominent railroad telegraph lines.

Mr. Adams-Randall is no novice in this field, as the records and past history show that he was one of the pioneers in telephony, and that his early inventions of 1877 to 1884 were proved improvements commercially, although driven out of the market, with others, by the Bell patent, which delayed the advance and use of the telephone so many years. Mr. Adams-Randall is also well known in the telegraph world, in connection with important improvements in rapid, or "chemical telegraphy," printing telegraphs and the electric, automatic date and time stamp, familiar to all telephonists and now so generally used.

Mr. Adams-Randall's photograph is shown herewith, and also the photograph of G. C. R. Marshall of London, who represents the owners of the patents and rights in this country and abroad.

UNDERGROUND CONSTRUCTION.

The telephone wires at Saginaw, Michigan, are being placed underground.

It is planned to install a conduit system for telephone wires at Cedar Falls, Iowa.

All electric, telephone and telegraph wires will be placed underground in New Castle, Pennsylvania.

The Newport (Ohio) city council has passed an ordinance compelling the Citizens' Telephone Company to place its wires underground.

An underground system for telephone wires will be installed at once in Doylestown, Pennsylvania.

The Empire State Telephone Company has asked permission of the Oswego (New York) authorities to put its wires underground.

A telephone conduit system will be built at Ottumwa, Iowa.

The telephone wires at Quincy, Illinois, will be installed in underground conduits.

The Hastings (Neb.) Independent Telephone Company will place its wires in the business portion of the city underground.

The Mt. Clemens (Mich.) Telephone Company has started to put its wires underground. It is expected that the work will be completed in about six weeks, as a large force of men are employed upon it.

Three young Missouri linemen in a fit of extraordinary ambition, took the trouble to ground a farmer's line one day recently. It took the farmers some time to locate the trouble, but they finally did, and then succeeded in locating the culprits, who were arrested, tried and compelled to pay $18.70 each for their fun.

PERSONAL

H. A. Hoges has purchased the telephone exchange at Franklin, Texas.

W. H. Lettle will construct a telephone system at Madisonville, Kentucky.

Mark Shanks will install a local telephone system at Portal, North Dakota.

James Abel will construct a telephone exchange at Lawton, North Dakota.

P. J. Weirich has been appointed manager of the Monroe (Wis.) Telephone Company.

W. I. Carpenter is putting in a new telephone exchange at Brewster, Minnesota.

S. J. Fletcher is manager of the new telephone company at Crutchfield, Kentucky.

A. J. Searcy of Searcy, Texas, has just put the telephone system of that place in good order.

D. J. Tolman has resigned the managership of the Biddeford (Me.) Telephone Company.

D. C. Bell has been appointed manager of the Union Telephone Company at Bonaparte, Iowa.

E. L. Wirt has purchased Mr. Wenke's interest in the Garden City (Kan.) Telephone Company.

Bert Watkins has been appointed manager of the Farmers' Telephone Company at Anchor, Illinois.

H. C. Hackney has been appointed manager of the Zenith Telephone Company of Duluth, Minnesota.

A. L. Cox has sold the telephone plant at Losantville, Indiana, to the Parker City Telephone Company.

Dr. C. J. Watson of Georgiana, Alabama, will install a telephone exchange at Greenville, same state.

B. D. Doan of Young Hickory is constructing an Independent telephone line from Gaysport to Cannelville, Ohio.

G. F. Stearns has been appointed manager of the Enterprise Telephone Company of New Hardwick, Minnesota.

George Mimms and others are interested in a movement to build a new telephone system at Trenton, Kentucky.

M. T. Sherman of Joplin, Missouri, is making arrangements to establish a telephone exchange at Jennings, Oklahoma.

William Goltra has been appointed assistant manager for the Home Telephone Company at Crawfordsville, Indiana.

I. B. Carpenter has been promoted to the position of superintendent of the Providence (R. I.) Telephone Company.

W. R. Trotter is superintending the work of constructing a telephone line in the vicinity of Fredericksburg, Indiana.

George H. Spangle has been appointed manager and purchasing agent of the Labette County (Kan.) Telephone Company.

J. B. Cowing and G. G. S. Campbell were granted a franchise for a local telephone exchange at Alexandria, Minnesota.

C. Jones and W. C. Covington will construct a telephone line from Wheelock, Texas, to Bryan, a distance of sixteen miles.

W. B. Bell of Tabor, Iowa, has made a deal whereby he has gained the controlling interest in the Thurman telephone line.

Charles Kester has been appointed secretary and manager of the People's Mutual Telephone Company, at Hillsboro, Illinois.

J. W. Smith of Washington, Iowa, has been appointed to take charge of the Moline exchange of the Union Electric Company.

Arthur M. Dole has been elected a director of the Pomona Valley (Cal.) Telephone Company, vice C. B. Sumner, resigned.

J. O. Jones has succeeded Miss Eva Trunnels as collector in the exchange of the Illinois Telephone Company at Whitehall, Illinois.

A. L. Childs and others of Sugar Valley, Kansas, are organizing a new company to connect with the Garnett Telephone Company.

Jacob S. Hoffman is constructing a new line from Lehighton, Pennsylvania, to Normal Square for the Lehigh Telephone Company.

E. H. Snedeker of New York has asked the city council for a franchise to construct a telephone system at Asbury Park, New Jersey.

J. G. Brannon and William E. Burke have purchased of the O. R. Riddle Telephone Company the exchange at Weatherford, Texas.

J. F. Miller has resigned as manager of the Montgomery County (Iowa) Telephone Company. He is succeeded by Grant Stokesbury.

C. A. Bryan and associates have formed a company to build a telephone line from Toluca, Virginia, to Fredericksburg, a distance of twenty miles.

W. A. Fleming, owner of the telephone exchange at Summerfield, Kansas, has disposed of his property. The name of the purchaser is not given.

Max Stadt, the fuse inventor, has organized a company at Los Angeles to be known as the Los Angeles Tool and Die Manufacturing Company.

W. L. Porterfield has applied to the board of supervisors of Santa Ana, California, for a long distance franchise for the Home Telephone Company.

J. H. Lochbaum and associates are petitioning the city council for a franchise to construct and maintain a telephone system at Sumas, Washington.

F. E. Burk and M. N. Byington are interested in the organization of the Siawasse and Genesee Mutual Telephone Company at Vernon, Michigan.

B. E. Brady has leased his Braymer, Missouri, telephone system to C. D. Mayhugh, proprietor of the exchanges at Mooresville and Utica, same state.

E. M. Ward, local manager of the telephone exchange at Hermann, Minnesota, is overhauling the entire system and making numerous improvements.

Davis Brothers, proprietors of the Arthur, Illinois, telephone exchange, are installing a new 200-drop switchboard. They will also put up 2,000 feet of cable.

J. E. Lord, J. F. Elder and C. F. Carson, who are the incorporators of the Cuero and Cheapside (Tex.) Telephone Company, will construct a system at Cheapside.

George A. Smith, manager of the Western Telephone Company's Linn county exchange at Brookfield, Missouri, was married recently to Miss Harriet Hemmings.

J. W. Gilbert has been made business manager of the Home Telephone Company of Bowling Green, Kentucky, and entered upon the discharge of his duties August 1.

H. W. Bishop has secured a franchise for constructing a telephone system in Eustic. He also contemplates organizing a company for establishing long distance lines.

S. W. Roberts, S. F. Newhall and H. M. Fisk have formed a corporation which will construct a telephone system at Cedarville, Illinois, and throughout Stephenson county.

J. A. Gunn and Lem Keithley are working on the extension of the Big Valley farmers' telephone line to Highland Springs, California, taking in Carpenteria and other places.

E. F. Westhoff, an energetic telephone man of La Grange, Missouri, has moved with his family to Sedalia, Missouri, where he expects to engage in telephone business.

W. W. Woodin will install a new telephone system for St. Joseph township, Illinois. The owners of the system will incorporate as the St. Joseph Telephone Company.

O. J. Hawkins, connected with the Home Telephone Company of Cohoes, New York, was recently the lucky winner of a drawing for a free trip to the St. Louis world's fair.

A. B. Crawford, general manager of the Hamilton (Ohio) Home Telephone Company, has resigned, to take effect October 1. He will be succeeded by William B. Thompson.

C. P. Mebane has assumed charge of the interests of the Massilon (Ohio) Telephone Company. Mr. Mebane was formerly with the Cuyahoga Telephone Company of Cleveland.

President F. S. Dickson of the Federal Telephone Company, Cleveland, Ohio, and Mrs. Dickson are spending their vacation on the St. Lawrence River and the Thousand Islands.

A. H. Foster has resigned as superintendent of the Rochester (Minn.) Telephone Company and will engage in the electrical supply business with his brother at Red Wing, Minnesota.

W. H. Trim, one of the most successful salesmen in the employ of the Monarch Telephone Manufacturing Company of Chicago, is spending a three weeks' vacation in northern Michigan.

Messrs. Stinson and Johnson of Kensal, North Dakota, contemplate installing a local exchange for McHenry, North Dakota. They will build a rural line to that point from Kensal.

O. O. Spencer of Wilson, Kansas, George Tolivar of Lucas, Kansas, and others have purchased from the Salina Telephone Company of Salina the line extending from Sincola to Plainville.

J. J. Speed of the Home Telephone Company of Springfield, Ohio, has purchased the necessary equipment and material to increase the capacity of the local exchange from 1,800 to 2,500 lines.

George G. King has succeeded W. F. Crossley as manager of the Youngstown (Ohio) Telephone Company. Mr. King has been connected with the company since its inception, and was one

of the men who had in hand its construction. He is also general superintendent of the company, and is a competent man in every way.

M. A. Dozier, who has been manager of the Williamson County (Tex.) Telephone Company for the past two and a half years, has resigned the position and will be succeeded by C. T. Barnes of Tyler.

Hon. R. B. Scarborough is interested in a new telephone system at Conway, South Carolina. The charter has been received, but stock will not be offered for sale until the exchange is in working order.

E. C. Shore, late superintendent of construction for the Duluth Telephone Company, has been appointed superintendent of the Minnesota Telephone Company, and will have his headquarters at Minneapolis.

L. G. LeBourveau has accepted a position with the Ewing-Merkle Electric Company of St. Louis as manager of their telephone department and is at present in charge of their exhibit at the World's Fair.

W. W. Boulden and R. H. Traylor of Bay City and A. W. McNabb of Matagorda, Texas, are interested in the Bay City and Matagorda Telephone Company, which has been incorporated with a capital of $50,000.

W. R. Harris, underground conduit designer and constructor, is now connected with the E. H. Abadie Company, Bank of Commerce Building, St. Louis. He will have charge of the company's construction department.

Secretary E. B. Fisher of the Citizens' Telephone Company of Grand Rapids, Michigan, announces that the new toll line of the company to White Cloud is now open and an exchange building will be erected at that place.

S. W. Roberts, S. F. Newhall and H. M. Fisk have formed a corporation for the purpose of constructing a telephone system in Cedarville, Illinois, and throughout Stephenson county. The company is capitalized at $7,000.

Messrs. Crosby & Blaisdell have purchased the exchange of the Freeport (Ill.) Telephone Company in Winslow, Illinois, and will consolidate it with theirs, which will give the citizens of that place free service with three counties.

Drs. Dwight Powell and Marshall Sedam, two well known young professional men of Logansport, Indiana, have abandoned the practice of medicine to enter the employ of S. P. Sheerin's Indianapolis Telephone Company.

E. C. Drews has been succeeded as manager of the telephone exchange at Colfax, Washington, by J. J. Lane. Mr. Drew will assume the management of the electric light plant in Marshfield, Oregon, in which he is interested.

Oliver Williams of Silver City, New Mexico, is authority for the statement that a California corporation had one of its managers in that city for several days recently looking over the Grant county telephone system with the idea of purchasing.

J. Y. Taylor, general manager for the Oklahoma Consolidated Telephone Company, was married recently to Miss Clara Avant, near Arapahoe. Mr. Taylor's headquarters are at Clinton, Oklahoma, and the couple will make that city their home.

F. R. Hillhouse, brother of A. S. Hillhouse, manager of the Stark County Telephone Company, formerly in the employ of the Central Union Telephone Company, has accepted a position in the traffic department of the United States Telephone Company.

James D. Houseman has been elected general manager of the St. Louis County Telephone Company, with headquarters at Clayton, Missouri. Until recently Mr. Houseman was general manager of the St. Louis, St. Charles & Western Railway Company.

H. W. Kent, superintendent of the British Columbia Telephone Company system, was in Bellingham, Washington, recently with a party of engineers, who are to make the final survey for the telephone cable line which is to connect that city with Victoria, B. C.

John H. Fowler, president of the Fowler Companies, Chicago, the well known cedar producers, has just returned from a short trip in which business and pleasure were combined. Mr. Fowler states that his companies are doing a good business in the pole and tie lines.

C. E. Corrigan, vice-president of the Osburn Flexible Conduit Company of New York, was in Chicago recently in the interest of his company. Mr. Corrigan says that "Flexduct," the conduit manufactured by the Osburn company, is being used more extensively than ever.

Messrs. Charles Stiger and Alfred Stromberg of the Stromberg-Carlson Telephone Manufacturing Company, visited the new plant at Streator, Illinois, recently. Manager Schuler is meeting with great success in conducting the exchange, and is overwhelmed with orders for service.

E. E. Stanton, H. D. Skelton, A. F. Nuquist and O. E. Mickey of Osceola, Nebraska, have purchased the Polk county interests of the Golden Rod Telephone Company and have incorporated under the name of the Polk County Telephone Company, with an authorized capital of $75,000.

Senor Don Parraga of Mexico City, who represents the interests of the Safety Insulated Wire & Cable Company, New York city, in the southern republic, has returned home after a two-months' trip here.

J. L. Zeitlow, president of the Dakota Central Telephone Company of Aberdeen, was in Mitchell recently making a thorough inspection of the telephone system, with a view to improving same. The Dakota Central company now owns the local and long distance telephone lines in Mitchell.

Manager F. H. Neal of the Jonesboro (Ind.) Home Telephone Company states that he is putting forth every precaution to insure the best of service. He has a force of linemen at work on the lines, and some new equipment will be added so the system will be in the best possible condition by winter.

J. W. Coffey, manager of the Home Telephone Company of Crawfordsville, Indiana, for the past two years, has resigned. He will take a vacation at his old home at Ellettsville, in the southern part of Indiana, for a few weeks, when he has in mind a similar proposition in another part of the state.

H. G. Slater, who built and equipped the Citizens' exchange at Waupaca, Wisconsin, and holds a mortgage on the plant, states that should the negotiations now pending result in the company passing into the control of the Bell company, he will at once take steps towards the installation of an Independent system.

W. C. Lewis of the First National Bank of Tallahassee, Florida, and Dr. Moor, mayor of Tallahassee, have been granted a franchise by the city council of Carrabelle, Florida, to construct an exchange at that place, which will put Carrabelle in connection with Thomasville, Georgia, and Tallahassee by long distance telephone.

F. R. Cheadle of Aurora, Illinois, and Louis Pitcher of Dixon, Illinois, were in Sterling recently in the interests of the Interstate Independent Telephone Company. It is expected that there will soon be some valuable improvements in the lines of the company at Sterling. The lines will probably be changed to copper circuit.

James G. Wells, Baldwin G. Steyman and Frank W. Kibbee, all of Brownsville, Texas, have incorporated the Brownsville Telephone Company, with a capital stock of $10,000, to build and operate a system in Starr, Neuces, Hidalgo and Cameron counties, Texas, and in the State of Tamaulipas, Mexico.

William G. Norman has been appointed manager of the Dubuque (Iowa) Telephone Company. Mr. Norman was for many years chief dispatcher for the Milwaukee railway system. He succeeds Victor Stevens as manager of the Dubuque company. The latter gentleman continues to hold the office of president of the company, although resigning his duties as manager.

F. B. Daley, representing the Arizona, Nevada & Southern Telephone Company of Needles and Kingman, has applied to the county supervisor for a franchise to construct a line from Needles to San Bernardino. It is the intention of the company to build to every mining camp of consequence and extend into Nevada and Arizona.

Neiman Wing, manager of the Wing Independent telephone system, operating in the vicinity of Grass Lake, Michigan, which is affiliated with the Citizens' Telephone Company of Jackson, has made connection with the Washtenaw Home Telephone Company, thus giving a complete Independent system between Jackson and Ann Arbor.

Joseph A. Murray of Wilkesbarre, Pennsylvania, has been appointed general manager of the Forth Worth (Tex.) Telephone Company. Mr. Murray has assumed charge, and has announced that the connection with North Fort Worth, Texas, will be made shortly. The poles have been put up, and the wiring remains to be put in place.

John Hansen, owner of the Davenport, Ohio, exchange of the Inland Telephone Company, is negotiating for the purchase of the Reardon exchange. He was the originator of the barb wire telephone in that part of the county, but has since transferred his lines to poles, and now has one of the most efficient country systems in the state.

H. C. Mock, the popular Kansas and Nebraska representative of the Monarch Telephone Manufacturing Company of Chicago, is spending several weeks in the Windy City, familiarizing himself with the new switchboard in process of construction by this well known company and otherwise getting in close touch with all the new features of this concern's telephone apparatus.

Frank B. Cook of Chicago, the well known manufacturer of protective apparatus and telephone accessories, has just started on an extended trip through the west, where he will endeavor to secure a much needed and well earned rest, and recuperate from the rush of work incidental to the enormous business he has done this year. Mr. Cook will go to Denver, Los Angeles, San Francisco and other coast points, and will probably return by the way of Salt Lake City, also spending some time in the Black Hills, looking into the progress there of the telephone company which he owns.

The Telephone in Foreign Countries

MANILA'S TELEPHONE SERVICE AND CONDITIONS.

THERE is an ancient Spanish proverb, seldom heard in Manila, but much observed, which says: "Poco barba, poco sober," or "Little beard, little wisdom." Unkind and self-centered Americans, engineers among them, have declared that the old *fraile* (a priest who belongs to one of the religious orders) who wrote the saw was thinking of the Filipino and his habits, says Arthur Stanley Riggs in *Electrical Review*.

The capital city of the archipelago is the only one whose service has come into general condemnation and, in fact, it is the only one in which there is any public system, except the government's military (Signal Corps, U. S. A.) lines. Equipped with exceedingly ancient Ericsson or Spanish apparatus, with a makeshift switchboard having none of the facilities of a modern exchange, the "red telefonica" or "telephone network," as it is called, is usually in difficulties of some kind, and is operated by native and nestizo (half-breed Spanish-Filipino) operators. Working under a practically exclusive franchise from the Spanish government (which we are bound to respect), the company may retain its rights and privileges eight years longer, "provided a satisfactory and proper service be maintained during such time." But right there the people say they want a new service.

The service, as a matter of fact, is so bad that the following incident will illustrate it more aptly than any mere superlative. A well-known promoter and former United States consul was trying one day to call up a certain newspaper in the walled city from his office over the river in Binondo, the Chinese quarter. He rang steadily, and three friends dropped in, one by one, chaffing him about "central." After about ten minutes he requested one of the gentlemen to keep up a steady ringing, and said he would drive over to the "red."

The friend took the receiver and began ringing, and Mr. J—— jumped into his *carromata* and dashed over to the walled city. In less than ten minutes his voice came over the wire, fairly sizzling, yet triumphant.

"Hello! that you, F——? This is J——. Yes, the 'red'; what do you suppose I found this black d——l doing? He was lying back in his chair, reading a paper and smoking, had his feet on the table of the board. One bare toe was keeping the drop of my line up, and he used the other foot to snap up the other drops as fast as they fell."

"Huh! What's that? Yes, I certainly did. I fixed that 'gugu' all right, but I can't reach the others."

At night, as the writer knows by sad experience, the operator frequently grounds or cuts out a line that is at all apt to keep him busy. Between nine and midnight the wires of the *Cablenews* and *American*, Manila's two large dailies, are frequently cut out for hours at a time, so that not only is it impossible to get central, but impossible to make a sound with the ringer in the office. Judge H. C. Ide, commissioner of finance and justice in the Philippines, told the writer one day that aside from the bad service already detailed, his telephone had the bad habit of going off by itself at all hours of night or day, so that about one-fourth of the calls in his house were mere false alarms. For that reason, he said, he had ordered the company to take its disturber away, but, with the listlessness of most such concerns in the tropics, they had not done so up to a very recent date.

Several attempts have been made to get an American company with good apparatus and operators to enter the field. The cost of installation is very high. American or good Spanish operators would have to be paid large wages merely to enable them to live and work, and the government has not made concessions of the sort that would enable a reputable company to do a legitimate business. Besides all this, at least two-thirds of Manila's white population believe another uprising is coming, and may be here within a year or two. Conditions are too complex to be detailed here, but it is safe and conservative to say that never before have the natives been so sullen and ugly, and that if they get a leader who can command them there will be trouble which could result only in the damage or destruction of all property, like telephones and telegraphs. The time is not yet ripe for the introduction of really American conveniences involving heavy expenditures and engineering difficulties, so for the present, at least, the white man who sickens under the glare of the watery sun in that mucilaginous climate must go on making the best of the evils and inconvenience he finds all about him, waiting hopefully for what may come—perhaps when he has left.

* * *

TELEPHONE WAYLEAVES.

Over in England the telephone men have their troubles, too. At least, so it would appear from the fuss they make over "wayleaves," the facts of which reach the public through the medium of the daily press and the electrical magazines of that country. A "wayleave" is unknown in America—at least by that name. It is a permit to erect poles in front of or on one's property, to string wires over one's house or land, to attach a standard to one's roof, etc.—in short, a right-of-way. In order to get these "wayleaves" the blooming telephone chaps of King Edward's domain meet with all kinds of queer and exciting experiences.

"We live in an atmosphere of wayleave difficulty," said a departmental chief of the National Telephone Company. "Our difficulties are extensive and various. The most preposterous claim I ever knew was that of a land owner outside of London who had a meadow, along the edge of which we wanted to erect a few poles. He calmly suggested that in exchange for the privilege of putting up the poles the company should build him a house. In another case in London where we wanted to put up a standard on a roof the owner asked £300 a year. As a dozen or more supports might have been needed on this batch of lines, you can see on what a scale we should have had to pay.

"Prejudice is another difficulty we have to fight against. A well-known and influential London solicitor has stated that wherever possible he will prevent the telephone service from spreading. As he is interested in a lot of property he has practically isolated his neighborhood from the telephone.

"Two ladies once ordered the removing of wires passing over their garden, alleging that their nephew, who thought he was entitled to their money, sent ghost messages by the wires, and the messages pervaded the house.

"The owners of a henhouse sought compensation because after telephone wires had been laid across the top of the house the hens laid fewer eggs. An irate property owner recently tied a group of offending telephone wires to a dog kennel containing a large dog, and then invited the telephone men to remove them. Another owner came out with his gun and threatened to shoot the men at work upon the wires. They descended at once."

The telephone men sometimes rise to the occasion. Here is the official report of one of them on a difficult case:

"The wayleave officer was threatened by the owner that he would kick him out of the place. The officer asked if he could get the wayleave after the kicking. The owner said 'Yes.' The wayleave officer prepared to be kicked, but the

position struck the owner as being humorous, and the wayleave was obtained."

Then there is another side to the wayleave question—that of the person of whom the wayleave is asked. One of this class recently wrote to the London *Electrical Review* as follows:

If you will permit a few words from me on a subject that I have had some dealings with, I shall be obliged. Your article speaks of the difficulties of obtaining overhead wayleaves; I think I can give a clew to one of the causes of these difficulties. A telephone company, desiring to pay a dividend, has to employ cheap labor, and as it is necessary that the outdoor linemen should be good climbers, it frequently occurs that sailors, and men used to ship rigging, are employed.

Now what do some of these gentry do? They come and ask for a wayleave. Anxious to accommodate the use of the telephone the owner agrees. Up get your friends on the roof. They are armed with a hammer, a 1¼ inch auger, and the inevitable ½ inch chisel. It doesn't matter if the number of wires to be passed through a hole is one or fifty. Through goes the 1¼ inch auger, and a little putty covers a multitude of sins. The ½ inch chisel appears to be used indiscriminately as a screw-driver, a crowbar, or even a soldering bit, while the hammer is plied vigorously, but not always in the right direction.

While this is going on, our friends are indulging in a little conversation, which appears to be built up on the principle of the condenser, *i. e.*, English and adjectives sandwiched together. They also hail their friends (male and female) in the streets below in the same polyglot, and finally, having finished their job, they come down.

If you are a trusting individual, you take their word for it that it is all right, and consequently wait until the next rainstorm, by coming through and ruining the ceilings you may have just decorated, throws some more light upon their operations; but if you have had experience, you insist on going up and having a look around for yourself, and when you behold the cracked slates and tiles, the cementing knocked off, and the damaged gutters, it is no wonder if you feel like indulging in a little "polyglot" yourself.

Let me at once state, for the benefit of would-be critics, that the above cases are becoming much rarer, as a better class of men are being trained to the business. My sole object is to impress on the telephone, etc., manager, the necessity of carefully choosing his men, and very frequent inspection of them—that is, if he wishes to retain the goodwill of a large section of wayleave granters.

* * *

WIRELESS TELEPHONY BY MEANS OF HERTZIAN WAVES.

In a recent issue of *La Energia Electrica,* published in Madrid, Spain, G. J. de Guillén Garcia records some interesting experiments made by him in conjunction with his son. In connection with some wireless telegraph researches, the son of the author happened to note that in the telephone of the Tommasi coherer located at the receiving station, there was a sound difference according to the air-gap in the interrupter of the Rhumkorff apparatus. This suggested the idea that a similar apparatus would be susceptible of transmitting the human voice to a distance without the agency of the wire, and after some delay the author was enabled through the courtesy of Prof. Marcel of the Barcelona Seminary to carry out his idea.

The experimental arrangement is a simple one: At the transmitting station there is a Rhumkorff apparatus of 3 cm. spark length, as well as the necessary oscillator, a small antenna and a grounded conductor. Between the transformer (*i. e.*, the Rhumkorff coil) and a small battery of Grenet cells, there is a special microphone acting both as manipulator and as interrupter. The automatic interrupter of the induction coil is stopped, while the condenser is used for reinforcing the oscillator spark. At the receiving station, there is a Tommasi coherer, connected to the receiving antenna and the grounded conductor. In a telephone receiver, the noise produced by the Hertzian waves on traversing the coherer is noted.

On approaching the mouth of the microphone and singing or speaking, every sound vibration will be attended by an interruption in the passage of the electric current through the primary circuit of the transformer, the number of sparks in the oscillator thus being varied. The underlying principle shows, therefore, some analogy with the mechanism of an ordinary telephone. The results obtained in the reproduction of singing are said to be quite satisfactory, whereas the rendering of speech leaves much to be desired. The trouble seems to be the difficulty of designing a microphone of sufficient intensity; Mr. Garcia, it is true, has remedied the imperfections of his apparatus to a certain extent by using a condenser and augmenting the potential difference. This, however, could not be driven too far, lest electric arcs be formed.

* * *

STEALING TELEPHONE WIRES IN INDIA.

Much annoyance and inconvenience to the telephone service in India have been caused by natives who have conceived the idea of stealing several spans of copper wire from the telephone line which establishes communication between Bangalore, Sivasamudram, the Kolar gold fields and intervening stations on the transmission line. The natives have a great liking for copper, since it forms a part of their wearing apparel, as jewelry for the ears, nose, toes and arms.

The police have repeatedly failed to capture the guilty parties; so the ever useful electrical remedy is now being employed. From 6:30 p. m. until 6 a. m. a pressure of about 1,000 volts is employed on the line, all telephones being disconnected therefrom. If telephone communication is desired at any point on the line, the operator on duty at the generating station is made aware of the fact by means of a signal lamp, which becomes extinguished by the blowing of a fuse at the latter place. The person desiring to talk, signals the operator at the generating station by short-circuiting the telephone line, thus blowing the fuse and extinguishing the signal lamp. The operator then disconnects the high voltage from the telephone line for the time being. This may seem to be rather a drastic remedy to employ, but it offers the only means of effecting a cure for all time.

* * *

TELEPHONE POPULAR AND CHEAP IN NORWAY.

Christian Schjetnan, who has just returned from a visit to his home in Norway, says that the telephone system is more generally used in that country than in any other in the world, and that the cost of the service to subscribers is about one-tenth of what it is in Mexico City, says the Mexico City *Herald.*

"Every foot of Norway is covered with telephone wire," said Mr. Schjectnan, when speaking on the subject. "The service is so cheap, being operated by the government, that even the poorest people cannot afford to be without one. It is impossible to find a business man who has not one upon his desk, and nearly every private house in the country has its telephone. In every restaurant in Norway, as soon as a person enters and takes his seat at a table, the waiter, even before he serves the water, places a telephone upon the table, so that the customer is able to converse with friends in any part of the country during the intervals of the meal.

"As for the service, I believe it is as perfect as it is possible to make it. In Norway, young girls are not entrusted with the business of making switches, this work being altogether performed by ladies of middle age, who are found to be sufficiently intelligent to attend to customers, and for this reason, it is a pleasure to speak through a telephone in Norway, instead of a task, as is often the case in countries that consider themselves more advanced.

"When a lady applies for a position on the telephone system of Norway she must possess the requirements necessary for admission to any department of the government service, as well as several other things that are considered important to this branch of the service. She must be able to speak, besides her own language, English, French and German, and before she is put on the line she has to spend six months in a practical study of the telephone system, including a short course in electricity, and if she is found sufficiently competent after this training she is given a position on the

line. These employes are generally ladies of thirty years and over.

"The material used by the government in its telephones and wires is of the very best, which helps to make the system the finest in the world. A good deal of platinum is used, which, when mixed with copper, makes the wire shine like gold. In the matter of excellence of material used, efficiency of service and cheapness of cost, I can state unhesitatingly that Norway leads every country in the world in telephone systems. Norway is also a great manufacturer and exporter of telephones. For many years now she has been manufacturing an article that compares well with the best that is made anywhere, and her exports of telephones to foreign countries are increasing every year. There is only one thing in which she cannot meet competition, and that is price, as her telephones are of such excellent material that they cannot be sold as cheaply as some others. For durability, however, they cannot be excelled."

* * *

GLASGOW TELEPHONES.

After experiencing, as was only natural, considerable difficulties in the earlier stages of the undertaking, thereby greatly rejoicing the hearts of its opponents, Glasgow appears to be doing remarkably well with its municipal telephones, says the *Pall Mall Gazette* of London. From the complete accounts recently issued of the second year's operations it appears that the capital expenditure to date has been £320,-782, and the number of instruments working is 11,405. This would give a gross cost per line of £28 2s. 6d., but it is only fair to state that this includes £9,957 for preliminary expenses, and £79,000 for 9,065 partially completed lines. If these items are deducted, the expenditure on the system actually working is £231,825, or £20 6s. 6d. per completed line, as against the estimate of £19 1s. per line. It is pointed out, however, that the difference is fully accounted for by the adoption of underground lines to a large extent where overhead wires were originally contemplated. The receipts for the year amounted to £53,095, or £4 13s. per line, and the working expenses, including interest and sinking fund, were £45,988, or £4 0s. 6d. per line. The net surplus is £3,651, which, added to £2,092 brought forward from the previous year, it is proposed to carry to a general depreciation fund: Seeing that the life of a telephone plant is estimated at thirty-six years, and that the Glasgow telephone loan is repayable in thirty years, the city looks like owning its system for something less than nothing a generation hence, if it can go on as it has begun. Even at present, however, the advantages to the business community must be considerable. for the tariff is only £5 5s. for an unlimited service, and £3 10s. with 1d. toll rate. The National Company charges £17 in London and £10 in the provinces, but then it has to pay dividends on a terrible lot of water, from which Glasgow is happily free.

* * *

THE TELEGRAPHONE.

Poulsen's telegraphone has been improved during the past year, says the London *Electrician*. The type in which the conversation is recorded by the magnetization of a steel wire being that which has been developed lately. A single motor now drives the instrument, reeling off the wire from one spool to another while maintaining proper adjustment with relation to the magnet. The wire is long enough to record a half-hour's conversation. A double pole switch with three positions provides that the telegraphone may be disconnected from the telephone, may be connected to the line for recording only, or may be connected to the line for recording while the instrument is actually in use. One may, therefore, call up a station, and after failing to reach his party, may leave his message on the steel wire to be heard later by the called individual.

TELEPHONE NOTES FROM ABROAD.

The German government operates 15,200 telephone stations.

A telephone system is to be installed at Ladysmith, British Columbia.

The contract for a telephone system at Jiminez, State of Chihuahua, Mexico, has been let to Weisil & Kok of Parral, Mexico.

At the annual meeting of the directors of the Chile Telephone Company, at Valparaiso, it was stated that there were 5,814 subscribers, a gain of 443 for the year.

The Western Electric Company of Chicago has secured a contract for the installation of a telephone system at St. Petersburg, capable of accommodating 40,000 subscribers. Wires are to be laid in American conduits.

The many attempts made by American companies to operate a telephone system in Manila have proven fruitless. So far the government has not made any concessions that would allow a reputable company to engage in business.

As the outcome of the recent strike among the female telephone operators at the Holborn exchange of the National Telephone Company in England, it has been decided to form a National Association of Telephone Operators.

It is stated that the accounts of Brighton municipal telephone department for the year ended March 31 show a deficit of £1,878 after charging £1,430 general expenses to capital account and without allowing for depreciation.

Conducting battles by telephone, as Japanese generals do, may be scientific, but it is going to play the mischief with the historic battle scene painters. How is a general to be made to look heroic when seated at a desk with a telephone at his ear?

The annual report of the Chile Telephone Company, with headquarters at Valparaiso, showed a gross revenue of $916,-542, an increase of $75,349. The expenditures were $442,-409, an increase of $20,890. The net income from all sources was $494,133, an increase of $54,459.

Customers are being booked by the municipal telephone corporation of Brighton, England, in such numbers that the original stock of 1,500 instruments is almost exhausted, and an order for 100 new instruments has just been placed. If these prove satisfactory another 400 will be ordered.

The directors of the National Telephone Company, Ltd., of England, have declared a dividend for the half year ended June 30 at the rate of six per cent per annum on the preferred stock and at the rate of five per cent per annum on the deferred stock, carrying £100,000 to reserve and about £9,000 forward.

A. S. Barnard, electrical adviser to the government of Ceylon, has in hand a scheme for providing telephone communication between the town of Colombo and ships in the harbor. As the ships lie some distance from the shore, submarine cables will have to be laid to buoys, and this will prove the most expensive item.

The success of the Holborn, England telephone girls in their strike against the National Telephone Company is having its effect elsewhere on the system. At the Manchester central office, where the girls consider themselves to be suffering under several disabilities, a number of the senior operators have discussed their grievances, and have agreed upon a united petition to the company for the maximum wage to be raised to £1, and other concessions.

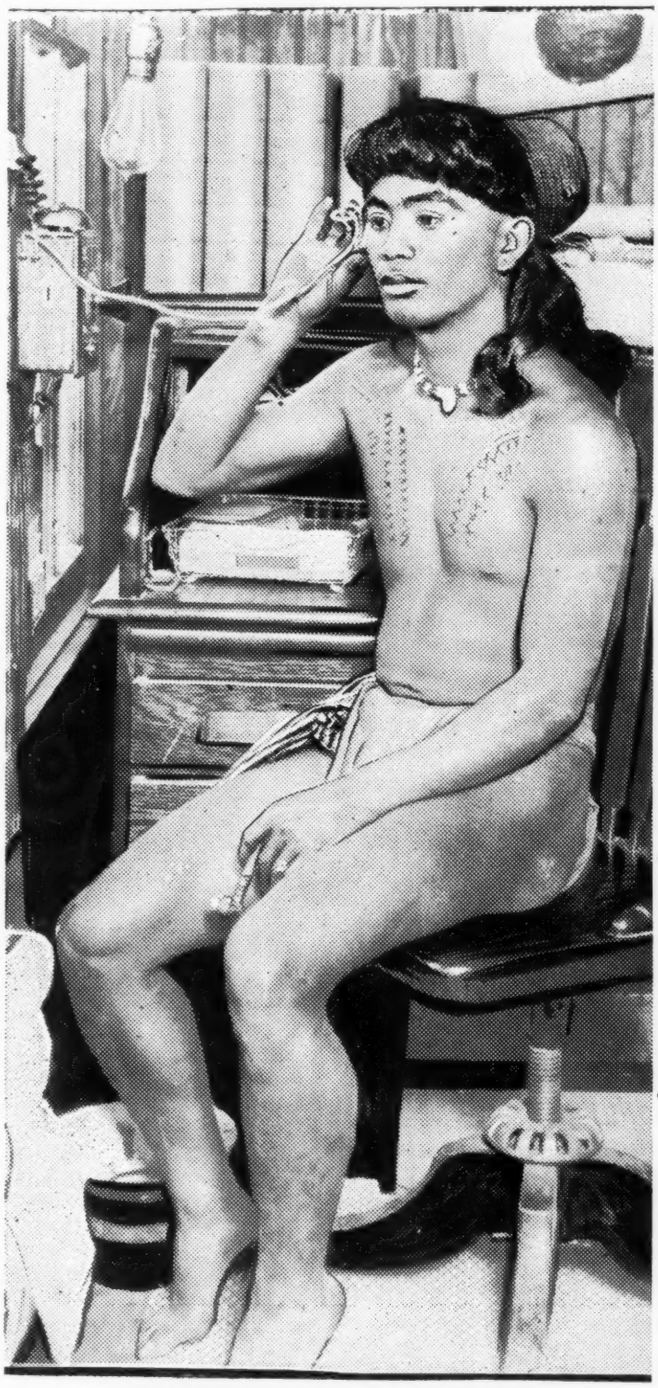
The bids invited by the Spanish Government Telegraph Department for the trunk telephone lines projected between Madrid and the French frontier towns of Hendaye and Port-Bou (with the ultimate looping through to Paris) have failed to attract offers, owing presumably to the unsatisfactory conditions made by the Spanish government. It is understood, however, that the scheme will again come forward, as there is a strong feeling both in Madrid and Paris that direct telephonic communication between the two capitals should be established without delay.

The Head-Hunters and the Telephone

IN COMPLIANCE with the request of Dr. Hunt, in charge of the Igorrotes at the Philippine exhibit, located in the southwestern portion of the World's Fair grounds, the Wesco Supply Company of St. Louis recently equipped a private telephone line from the hut of Antonio, chief of the Bontoc tribe, to the domicile of Bassassan, chief of the Suyocs, with a branch leading into Dr. Hunt's private office.

This installation has the curiosity of the savages wrought up to a high pitch and to see the expression on their faces, when they hear their native language through the receiver, is very amusing to the visitors. The first thing Chief Antonio did was to call up Dr. Hunt and ask him if he "ate dog," this being a favorite question asked by a majority of the World's Fair visitors of the Igorrotes.

The more the natives saw of the workings of the telephones in their chiefs' huts the more they were impressed and fascinated, and each lusty Igorrote became seized with a burning desire to possess one of these strange instruments and talk through it. To them the telephone apparatus was merely a box with a hole in it, and each of the shrewd little brown men immediately set about to procure the material with which to make him a "talking box" like his chief's. Empty cigar boxes by the dozen were brought into the village, and after holes had been cut in them by the curious Filipinos they were affixed to the sides of their respective huts. Then the natives talked into them, as they had seen their chiefs do, and great was their surprise when they received no reply. Some of them thereupon started investigating and were not long in learning that the telephone was more than the mere box they had fancied it to be, consequently they are more mystified than ever concerning it, and next to the all-absorbing question of "dog" the wonderful "talking box" is now the chief subject of conversation among them.



CHIEF ANTONIO USING THE TELEPHONE.

These primitive people are quick to grasp new ideas, and the telephone is now used by them to a large extent for carrying on their daily vocations and the issuing of orders by the two chiefs.

Dr. Hunt recently informed a representative of the Wesco Supply Company that several of the villagers had requested him to keep aside out of their daily earnings sufficient money to purchase short telephone lines, which they intend to take back to the Philippines after the fair. Some of them own large tracts of land at home, and all of them are saving up considerable money presented by visitors for performing native dances, which it is their intention to invest in telephones.

Through the courtesy of the St. Louis *Post-Dispatch*, TELEPHONY was enabled to secure the accompanying illustration, which shows Chief Antonio in his hut in the act of telephoning. The far-away expression on his face would seem to signify that he is getting his full money's worth of enjoyment out of the "talking box," and the further fact that his precious cigarette rests between his fingers slowly consuming itself indicates that the noble warrior is so deeply absorbed in the novel act of telephoning as to be utterly oblivious to all his surroundings.

The first few days that the telephones were placed in the huts of Chiefs Antonio and Passassan, these two highly important personages spent most of the time conversing over the line. Awe at first gave way to wonder, and lastly to pleasure, and the two chiefs, after the novelty of the thing had worn off, allowed their subjects to take a turn at the instruments, and it is said that their explanation of the telephone's workings was unique, to say the least.

It will be observed that Chief Antonio's costume is extremely meagre, and very much of the sort that our first parents wore in the Garden of Eden. In spite of the fact that it is the same style of dress (or undress) as is affected

by him and his people when on their native heath (and in their opinion the correct thing), there has been a storm of protest raised by some of the more prudish visitors to the Igorrote village against the scant attire of the savages. President Roosevelt was finally appealed to and sent an order to Dr. Hunt that the Igorrotes must in the future wear linen pants and coat. The new costumes were accordingly ordered, made and distributed among the brown men, who showed their contempt for the powers that be and for civilized clothing by hanging the garments along the roofs of their huts, as a sign of their scorn for the American style of dress. No power of persuasion could induce them to wear the pants and coats and their determined action finally resulted in the original order from Washington being rescinded.

Prof. Frederick Starr of the University of Chicago appears as a defender of the Igorrote manners and customs. Criticising the public horror over the eating of dog meat by this tribe from the Philippines, Prof. Starr says sarcastically: "It is curious that the killing of a few dogs by these people should arouse these sensitive souls so much more than the wholesale killing of lambs and pigs for ourselves. As between dog meat and pig a wise man might hesitate, but eventually would probably decide for the Igorrote custom."

The practice of this tribe of wearing little or no clothing is also defended by Prof. Starr. To those who would clothe the Igorrotes, he says: "Surely anyone who can see aught but beauty in these shapely bodies and fine brown skins or whose appreciation of that beauty is disturbed by any evil thoughts is certainly wrongly constituted."

SUNNY JIM'S REPLY.

In the Minneapolis *Tribune* of a recent date appeared the following communication from the pen of J. J. Nate, which we take pleasure in presenting to our readers, as it is of general interest:

I trust you will allow one who has had much to do with telephone matters for over twenty-seven years to be given a brief hearing in reply to comment under the heading of "Thoughts on Things, Material and Immaterial," in your issue of Wednesday, July 27, referring to busy lines and telephone service, wherein you ask, "Well, what is the answer, central?" Most simple. If one line is not sufficient to take care of your business, add another one, and still another. Many of our wholesale houses are using as many as ten separate wires in order to take care of the volume of business coming to them daily. One wire will no more take care of the business of a concern which is called hundreds of times from among 10,000 subscribers than could one wagon deliver the goods which may be sold during the day by a large wholesale establishment. If one's business grows, additional room is secured; if more customers call, clerks are added; when correspondence increases, more stenographers are employed; as departments develop, the number of superintendents is increased; and if the office of a professional man is crowded and patients or clients are pressed for time, assistants are employed. In fact, in no calling whatsoever with the growth of a business is it possible to continue with the earlier force and accommodations. This condition is precisely true of the telephone. It is your servant, and as one's business or social interests grow, the more need of taking prompt care of all telephone calls. In order to care promptly for the wants of friends, customers or clients, add one or more telephones.

THE RIGHT ONE.

"You know," said the man on the car, "we have two telephones in the office, and whoever answers the 'phone is expected to say at which one you are wanted.

"Well, we've got a new office boy, and the bell rang the other day. He answered it, and went to the manager. 'You're wanted at the telephone,' he said, 'by a lady.'

" 'Which one?' asked the boss, thinking of the 'phones, of course.

" 'Please, sir,' stammered the boy, 'I—I—think it's your wife.' "

WELL KNOWN HEADS OF WELL KNOWN HOUSES

The accompanying picture is an excellent likeness of Edward P. Baird, president and treasurer of the Baird Manufacturing Company of Chicago, which concern makes the famous Baird pay-station and measured service equipment. Mr. Baird is a versatile inventor, who has invented all of the many styles of pay stations made by his company, and is constantly at work on new ideas in connection with pay station machines. The motto of the Baird Manufacturing Company, "We do not wait for the demand, we anticipate

it; our goods prove it," aptly expresses the untiring zeal with which new ideas are pursued.

Before Mr. Baird entered the pay-station field the cheapest toll machine then on the market sold at $30, and telephone companies consequently could afford to use them but sparingly. Mr. Baird producing a reliable three-slot toll machine selling at $8 a long felt want was met and telephone companies thereby enabled to locate pay-stations liberally.

Mr. Baird has for some time been working on a rapid service pay station for use on central energy or magneto systems, which closely approaches the ideal. Though accomplishing everything to be desired the mechanism of this new type of machine is very simple, strong and durable. Aside from pay stations Mr. Baird has invented a time stamp, self-winding clock, blue blaze gas burner, telephone transmitter arm, window advertising clock and other specialties. He is an example of the rare combination of inventor, financier, manufacturer and salesman.

Telephone Tales Tersely Told

Municipal ownership of the telephone system is being agitated at Council Bluffs, Iowa.

At Shell Prairie, Minnesota, it cost a man $50.70 to shoot a telephone pole insulator.

The Central Telephone Company's exchange at Quincy, Florida, was destroyed by fire recently.

The Colorado & Midland Railway Company has equipped its line with a telephone system.

The Youngstown (Ohio) Telephone Company has increased its capital stock from $200,000 to $400,000.

The Bloomington (Ind.) Telephone Company has decided to expend about $25,000 in improving its system.

The exchange of the Independent Telephone Company at Van Buren, Indiana, was recently destroyed by fire.

The exchange of the Wabash (Ind.) Home Telephone Company at Treaty, Indiana, was recently destroyed by fire.

The Grand Island (Neb.) Telephone Company is installing a new switchboard at an estimated cost of $10,000.

The Home Telephone Company of San Diego, California, contemplates making extensive additions to its service.

The Tri-State Telephone Company is installing an up-to-date telephone exchange in Grand Forks, North Dakota.

The United States Telephone Company of Cleveland has increased the wages of its fifty operators 10 per cent.

The Citizens' Telephone Company of Columbus, Ohio, has increased its capital stock from $750,000 to $1,250,000.

It is said that in Richmond, Indiana, the Home Telephone Company has one telephone to every ten inhabitants.

The Grayson County Telephone Company's exchange at Denison, Texas, recently sustained heavy damage by fire.

The People's Telephone Company at Leavenworth, Kansas, will expend $70,000 in rebuilding and equipping its plant there.

The Standard Telephone Company operates 207 miles of line in Clayton county, Iowa, according to this year's assessment.

The new Independent telephone company at Salt Lake City has begun giving service with thirty-five operators employed.

The Automatic Telephone Company has applied to the city council for a twenty-five year franchise in Quincy, Illinois.

A telephone system to operate in connection with the Gunnison tunnel in Colorado will be constructed by the government.

At its annual meeting held recently the Home Telephone Company of Filley, Nebraska, declared a 10 per cent dividend.

The business of the Pomona Valley (Cal.) Telephone Union continues to increase. About 600 subscribers are already served.

It is understood that the Queen City Telephone Company of Cincinnati will ask the city council of Covington, Kentucky, for a franchise.

A warrant has been issued for the arrest of W. E. Cook, a farmer near Macon, Kansas. His crime was swearing over the telephone.

All the telephone companies operating in the ten villages of Ontario county, New York, are taking steps towards a consolidation of interests.

It is announced that the Consolidated Telephone Company will expend about $100,000 in improvements in the vicinity of Reading, Pennsylvania.

The stockholders of the Union Telephone Company, with headquarters at Alma, Michigan, have declared a semi-annual dividend of four per cent.

The Elkhart (Ind.) Home Telephone Company will expend $6,000 in new cables in Goshen and additional switchboards for both Goshen and Elkhart.

The exchange of the Independent Telephone Company at Van Buren, Indiana, including switchboard, office fixtures, etc., were recently destroyed by fire.

The Independent Telephone Company at Topeka, Kansas, has at present 2,700 subscribers and new subscribers are being secured at the rate of 150 a month.

Business men of Fairfax, Minnesota, have purchased the local exchange of the Minnesota Central Telephone Company and will make improvements at once.

The Consolidated Telephone, Telegraph and Electric Company has been organized at Tucson, Arizona, to acquire and build a complete system of telephone lines throughout Arizona, New Mexico and western Texas.

The Home Company of Kansas City now has upwards of 9,000 telephones in service, and has completed its long distance lines to St. Louis and all intermediate points.

The Kinloch Telephone Company is rushing work on the construction of its toll line to Springfield, Illinois. It is expected the line will be in operation by September 15.

Work on the extensions of the United States Telephone Company's lines is being pushed rapidly and by the end of the summer $150,000 will have been spent in new lines.

Independent telephone interests have again taken up the matter of securing a franchise in Dallas, Texas. It is said that the chances for securing a franchise are excellent.

The Central State Telephone Company of Oberlin, Kansas, incorporated with a capital stock of $60,000, paid a three per cent quarterly dividend for the quarter ending June, 1904.

The Keystone Telephone Company of Philadelphia reports that its net earnings for the quarter ended June 30, 1904, were $86,241, against $53,987 for the corresponding period of 1903.

The Home Telephone Company of Springfield, Missouri, will increase its present capacity of 1,800 to 2,000, which will necessitate the purchase of new cable, switchboard and telephones.

Directors and shareholders of the Peninsular Telephone Company of Tampa, Florida, have laid plans for enlarging their system, which is now the most extensive in any town in Florida.

Miss Ethel Bolan, a telephone operator at Dixon, Kentucky, was killed August 14 during an electrical storm. She was seated at the switchboard. Another operator in the room was not hurt.

The Lake Shore Telephone Company of Hart, Michigan, has just issued its usual 2 per cent quarterly dividend checks. The company will build a line ten miles long extending from Hesperia.

The board of directors of the Tri-State Telephone and Telegraph Company of Minneapolis has declared a semi-annual dividend at the rate of 5 per cent on the common stock of the company.

The Mutual Telephone Company has been incorporated with a capital stock of $50,000, to construct and operate lines in Ellis, Dallas, Kaufman, Hill, Navarro, Johnson and Tarrant counties, Texas.

The Pennsylvania railroad is putting in telephones between its signal towers and will use a telephonic system of intercommunication instead of the existing telegraphic methods to operate the block system.

The June earnings of the Cuyahoga Telephone Company showed an increase of $1,000 over May and a big increase over the same month last year. New contracts are being made at the rate of 275 per week.

The United States Telephone Company of Cleveland reports from January 1 to May 31, 1904, gross earnings, $169,487; expenses and taxes, $99,865; net earnings, $69,622; deductions, $41,671; surplus, $27,951.

Improvements costing $15,000 are contemplated by the Home Telephone Company of Charleston, West Virginia. This will include a trunk line to Columbus, Ohio, and short toll lines into the Kanawa coal fields.

The Home Telephone Company of Los Angeles is building a large central station at Glendale for the district including Glendale, West and North Glendale, Tropico, Ivanhoe, Eagle Rock, Burbank and Toluca.

The Iron Range Electric Telephone Company, operating through northern Minnesota, held its semi-annual meeting in Wadena, Minnesota, recently. For the first six months of this year it paid a dividend of 9.6 per cent.

The attempt of the Cleveland city council to knock out the franchise of the Cuyahoga Telephone Company because it raised rates in some instances, has ended in failure. The council cannot regulate telephone rates.

The Home Telephone Company of Niagara Falls, New York, will expend between $35,000 and $40,000 in improving the local service. A new exchange station will be built and the latest improvements will be installed.

Slot machines which will not work unless you pay five cents per conversation are bound to be adopted by the telephone companies throughout Iowa, according to E. H. Martin of Webster

City, who owns more telephone lines than any other man in Iowa.

Territorial Auditor Baxter states that the total assessment on telephone companies this year in Oklahoma will be at least $30,000 greater than last year. He estimates the total assessment on such property this year at $135,000.

The annual meeting of the Three Rivers (Mich.) Telephone Company was held recently and the report of the secretary and manager were more than satisfactory to the stockholders. A 6 per cent dividend was declared.

At a meeting of the stockholders of the Crawford County Telephone Company, held in Denison, Iowa, recently, a dividend was declared of 10 per cent per annum. The report of the secretary showed a cash investment of $60,000.

Wabash, Indiana, grocers have entered into an agreement to remove the Central Union telephones from their places of business. There are only a few Central Union telephones in the city, the home company having absorbed almost the entire list.

The Wing system of Independent telephone lines in Michigan, affiliated with the Citizens' Telephone Company, has made connection with the Washtenaw Home Telephone Company, giving a complete Independent system between Jackson and Ann Arbor.

The Home Telephone Company of Owensboro, Kentucky, is arranging to construct 12,000 feet of cable through the western part of the city. It will install a four-party selective ringing system and make other improvements. The company now has 1,364 subscribers.

The last link in the coast to coast telephone line has been finished, and now Maine can get connection with Oregon via Kansas City, Denver, Cheyenne, Ogden and thence northwest through Butte. The present facilities in the west limit talking to about 1,000 miles.

Miss Emilie Brewer, sister of Justice David J. Brewer, worsted the New England Telephone Company in its attempt to plant a pole in front of the Brewer homestead at Stockbridge, Massachusetts. She camped out nearly all night beside the hole with two servants.

The farmers' telephone line in Flathead county, Montana, is getting along at a rapid rate. The company has 150 miles of wire now up, and expects to put up 150 miles more, connecting 200 farmers with Kalispell and the telephone exchange when it is fully completed.

Receivers have been appointed for the Standard Telephone and Telegraph Company, capitalized at $100,000, which operates in Bucks County, Pennsylvania, and in New Jersey. Both the Bell and Keystone companies have been trying to buy the property for some time.

The Interstate Independent Telephone Company has just issued its thirteenth regular quarterly dividend. This company has in operation exchanges at Aurora, Elgin, Springfield, Plainfield, Joliet and Sterling, Illinois, and will have its exchange at Peoria in operation about November 1.

The Girard (Ohio) Telephone Company, recently incorporated, will at once begin the installation of an Independent telephone system. An exchange with a capacity of 400 telephones will be installed under the direction of S. C. Thayer, who will be the superintendent of the plant.

The sale of a boy's invention of a wireless telephone has been confirmed by Judge Kerrigan of San Francisco. The youth is Francis Joseph McCarty, and his invention was purchased by the McCarty Wireless Telephone Company for $1,500 cash and 120,050 shares of stock in the company.

A bill has been filed in the general assembly of Louisiana requiring all foreign corporations doing or intending to do a public telephone business in that state to incorporate under the laws of the state on or before January 1, 1905, or thereafter be prohibited from doing business in the state.

The special telephone committee of the Commercial Club of Council Bluffs, Iowa, reports there is plenty of financial backing in sight to insure the construction of an Independent system in that city. The club voted the incorporation of a new company to be started as soon as possible.

The Phoenix (Ariz.) Independent Telephone Company has been formed to install an Independent system. It is proposed to utilize a franchise held in the name of Jerry Millay, a local attorney. The system is to have full metallic circuits and the initial expenditure for installation is to be about $50,000.

The Home Telephone Company of Riverside, California, has purchased a site for its headquarters in Riverside and work has been commenced to clear the ground for its new building. It will be a handsome two-story structure, with pressed brick front, having fifty-seven feet frontage and a depth of 125 feet.

Since the Columbus (Ga.) Telephone Company has been in operation it has made such rapid strides that it is necessary to enlarge its quarters. It now has in the neighborhood of 1,000 subscribers, and additional space is desired to make room for more selector boards so that a much larger number can be accommodated.

The Dublin (Ga.) Telephone and Manufacturing Company has just completed the new copper circuit line of the company's telephone system from Dublin to Macon, Georgia. Dublin now is in talking touch with Atlanta, New York, Chicago, Boston and almost all larger points by a complete telephone system.

It is stated that the capacity of the Columbus (Ohio) Citizens' Telephone Company will not be increased until after January 1, 1905, as its new building will not be completed until November 1. The new plant will have a minimum capacity of 8,000 telephones, and this can be increased to any desired number.

The Reading, Ohio, city council has an application for a franchise from the Queen City Telephone Company of Cincinnati, and Mayor Cooper says that it will be granted. A resolution has been passed forbidding the Cincinnati and Suburban Company (Bell) erecting more poles or stringing wire in the village.

So far, 663 street police telephone boxes have been put up in Manhattan by the New York Telephone Company, and these having proved successful, the whole of the Greater City is to be covered in a few months' time, providing for a perfect system of intercommunication from any call box to any police station.

It looks as if there was a movement on foot to consolidate the Independent telephone companies of Michigan, and unite the system with those already developed in other states. The Washtenaw Home Telephone Company has already spent $25,000 or $30,000 in Ann Arbor and vicinity and is about ready to begin business.

The Ohio Valley Telephone Company, which recently purchased the telephone system at Bellaire, Ohio, has applied to the city council for a new franchise. The company states that if the franchise is granted a new exchange building will be erected, new lines built, and from $65,000 to $75,000 expended on improvements.

A race between the Central Union Telephone Company and the Delaware and Madison County (Ind.) Telephone Company, whereby the first in the field would get the new suburban line between Elwood and Curtisville, was won by the Independent company, by hauling the poles at night and beginning the erection at daybreak.

The building and grounds committee of the Chicago city council has received a recommendation from Superintendent Cooley and Business Manager Guilford that a public school telephone system be installed. The estimated cost of installing the system is $40,597. If the police wires and operators are used the cost would be reduced to $30,000.

The stockholders of the Union Telephone Company of Alma, Michigan, have authorized the board of directors by a vote of 99 per cent to increase the capital stock of the company from $400,000 to $500,000. Of this amount $50,000 becomes immediately available for enlarging the company's exchanges and extending the toll lines.

The local telephone company at St. Johns, Michigan, which handles an extensive rural service, is seeking to make its service indispensable by furnishing subscribers with the government daily weather reports, and other important news of the day. Signals are rung each morning on all farm lines, and all who desire may get this report.

An effort is being made to put the Thomas E. Clark Wireless Telegraph-Telephone Company of Pontiac, Michigan, on its feet again in that city, and with that end in view the directors have voted to issue $60,000, which, it is stated, will put the concern in good shape, clean up outstanding indebtedness and leave it a good working capital.

Into the laundry of Charlie On, Meriden, Conn., the first telephone to be installed by any Chinese in New England has just been put. None of the Mongolians in town had talked through one before, and they crowded Charlie's shop all the evening to "buzz" the girls in the central, who spent all their spare time "jollying" the little yellow men.

G. H. T. Schaefer has been awarded the contract for the construction of the new building of the Atchison (Kan.) Telephone Company. By the first of next year the company will be installed in its new exchange and will have its plant thoroughly reconstructed and improved, and in condition to give first class local and long distance service.

The telephone situation at Raleigh, North Carolina, is unchanged and there are still three systems in operation. It is said there would have been a merger of the Bell and Interstate systems but for the fact that the Raleigh Telephone Company positively refused to sell out. It now appears to be the belief that all three systems will continue.

The Indian Territory Telephone Company, with headquarters at Vinita, has sold its local exchange at Tulsa to the Pioneer Telephone and Telegraph Company of Oklahoma City for a consideration of $10,000. The trade carries with it the business of three long distance lines centering there, with connections in Texas, Okla-

homa, Missouri and Kansas. Less than two years ago it was purchased for less than $6,000 and has been on a paying basis ever since.

At a recent meeting the board of directors of the Home Telephone Company of Rockford, Illinois, voted to refund the $200,000 issue of six per cent bonds and make a new issue of $250,000 in five per cent bonds. The increase will enable the company to extend its toll line system and make other improvements required by a growing business.

The Independent Consolidated Telephone Company, which has made considerable progress in Wisconsin in the last few years, is preparing to enter Milwaukee. The company is selling stock with a view to extending its system from Jefferson to Milwaukee. The line will be built to the city limits and then the first steps will be taken to get a franchise.

The United Telephone Company of Pottsville, Pennsylvania, having raised its rates to subscribers, the city council declared its franchise forfeited and ordered the company's poles and wires removed. The company thereupon canvassed its subscribers, asking them to petition the council to allow them to remain, promising in return a reduction of rates.

The city council of Hastings, Nebraska, has granted a thirty-year franchise to the Hastings Independent Telephone Company, reserving the right to purchase the company's property at the end of ten years at an appraised valuation to be determined upon by designated citizens. Wires in the business portion of the town will be placed underground.

The several rural telephone lines centering in Hammondsport, New York, have formed an association known as the Hammondsport Rural Telephone Association. The following officers have been elected: Robert Sherer, president; Maurice A. Hoyt, manager; J. E. Little, Oakley Wixom, L. Wortman, Harry Niver, Fred Ovenshire, Henry Emerson, directors.

The Mississippi Valley Telephone Company at Warsaw, Illinois, has come into possession of the Bell lines and exchanges at that place. It has absorbed the Young and other country lines, the exchange at Elvanton, and is gradually absorbing the lines and exchanges of the county. It is proposed to put all in first class condition and greatly improve the service.

All the doctors in Atchison, Kansas, have entered into an agreement under which they will do away with the Bell telephones after October 1. They made this announcement early in August, in order to give all an opportunity to make a change of telephone that desire to do so, as after October 1 it will be impossible to get an Atchison doctor over the Bell telephone.

Articles of incorporation of the Suburban Telephone Company were lately filed in the recorder's office in Clayton, Missouri. The capital stock is $100,000, divided into 2,000 shares; par value, $50 a share. The company was organized for the purpose of providing telephones for the people of St. Louis at rates greatly reduced from those offered by the older companies.

The Illinois Central is to expend $500,000 in reorganizing and improving its system. Wires weighing 400 pounds to the mile will be substituted for those of 175 pounds, now in use. This, with improved instruments, it is hoped, will make conversation between Chicago and the Gulf as easy as talking across a small room. The telephone system is also to be extended over the Omaha division.

At a meeting of the directors of the Home Telephone Company of San Diego, California, it was voted to create a bonded indebtedness of $500,000. For the present only two-thirds of this sum will be floated, and it is stated that that amount has already been underwritten by local and northern capitalists. Work has been commenced, and the system will be in operation by the end of the year.

A deal has been made between the Home Telephone Company and the Badger State Telephone Company whereby Beloit, Wisconsin, will be connected by an Independent telephone line with Rockford and other northern Illinois towns. This means the opening up of the whole of southern Wisconsin to the people of Rockford by telephone, as well as direct communication as far north as St. Paul.

A petition has been filed with the board of supervisors of San Bernardino county, California, for a telephone franchise for a system extending from the west end of the Santa Fe bridge across the Colorado, southeast of Needles to Goffs, Daggett, Barstow and other desert towns, following the Santa Fe right of way into San Bernardino. The company is backed by a rich Arizona syndicate.

The Huntington syndicate of California is rapidly carrying out its plans for a through long distance telephone line between the Atlantic seaboard and the Pacific coast. The acquired lines in Louisiana and Texas and the existing lines in Texas leave a gap of 600 miles in Texas between San Antonio and El Paso and all of New Mexico and Arizona to be filled in. The syndicate is closing negotiations for the purchase of long distance lines through Arizona and New Mexico, which will leave about 800 miles of wire to be put in to establish connection between Los Angeles and New Orleans.

Whitley county, Indiana, is reported to have more telephones in service, operated by one company, than any other county in Indiana, averaging one telephone to every twelve inhabitants. In Columbia City and the town of South Whitley and Churubusco, the figures are still more surprising, for they show one telephone to every seven persons. The company is now giving service to 1,600 subscribers.

An Independent telephone company with a capital of $3,000,000 has been formed in Chicago, which will build and operate lines between the great packing centers—Chicago, Kansas City, Omaha, Sioux City, St. Joseph and St. Paul. It is stated that a contract has been made with Armour & Company guaranteeing a fourth of that company's business. This contract is said to be worth $75,000 a year.

Windham, Maine, will have the automatic telephone service within a short time, according to a recent statement made by General Manager Goudy of the Northeastern Telephone Company. The system is already nearly completed in the town of Gorham, and as soon as permission is received to enter the town of Windham, the new system will be installed in South Windham and other parts of the town.

C. E. Egan of Kenosha, Wisconsin, has invented a telephone which it is claimed will greatly reduce the cost of carrying on such communication. He is now making plans for the organization of a company and it is possible that the factory will be located at Kenosha. Mr. Egan already controls some thirty patents on telephone instruments, but it is claimed that the one just perfected is of greater value than any former one.

At a recent meeting of the stockholders of the West Virginia Western Telephone Company, it was decided to merge the interests of that company with the Marietta Independent telephone system. This was done to retain the services of J. H. Linginger, president, and A. C. Davis, general manager, who were large holders of stock in the Marietta company, and who had intended to resign in order to give all their time to that company's interests.

Coincident with the completion of the concrete foundation for the Home Telephone Company's new building in San Diego, California, the plans for the structure proper were received from the Automatic Telephone Company of Chicago, to whom they were referred for approval. The drawings show an extremely handsome front, the materials of which will be brown stone to the second floor, above which pressed brick and terra cotta will be used.

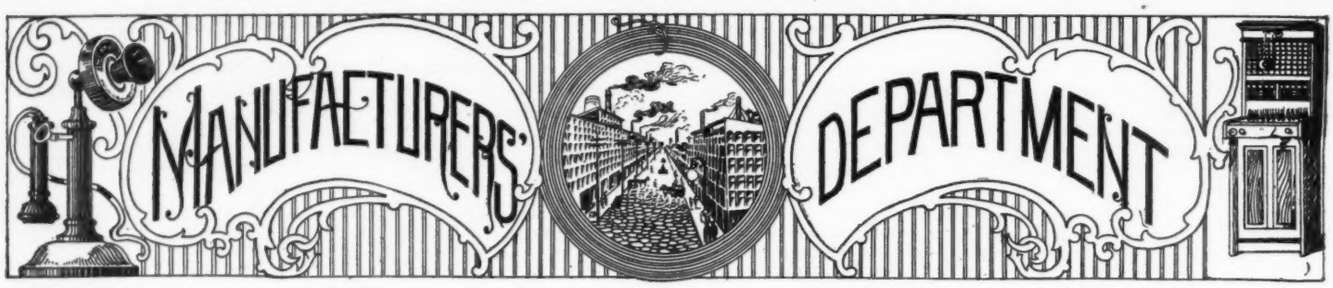
A short time ago Frederick S. Dickson, president of the Cuyahoga Telephone Company of Cleveland, sent out a list of invitations to the stockholders of the Cuyahoga Telephone Company and patrons, asking them to visit the exchange on the top floor of the Electric building, and inspect the manner and method of doing business. The reception was held two days recently. The Cuyahoga Telephone Company has just put in an entirely new outfit.

The Tri-State Telephone Company is perfecting plans for the construction of a submarine cable for the extension of the line to East Dubuque, Iowa. The work of building the cable has already been commenced at a Chicago factory and it will soon be completed. It will require 2,375 feet of submarine cable to span the river, besides 3,600 feet of aerial cable, which will be run from the river's banks to where the wires spread out in Dubuque and East Dubuque.

Between tree trimming and bee hunting the Fremont (Neb.) Telephone Company is having a hive of trouble just at present. The weather this summer has been of an ideal variety for tree growing, and the branches coming in contact with the wires cause much annoyance. Bees also are creating a nuisance in some of the cable boxes about the city, and dispute the right of workmen to tamper with their property. It is an unpleasant task to fight bees on telephone poles.

The employes of the Cuyahoga Telephone Company of Cleveland received recently their dividend on the income of the business for the first six months of the year. This dividend amounts to six per cent of the entire amount of wages received during that time. The plan has been in operation a year and has proved quite satisfactory to the company, as well as the employes. The company now employs about 400 persons and the dividend will amount to several thousand dollars.

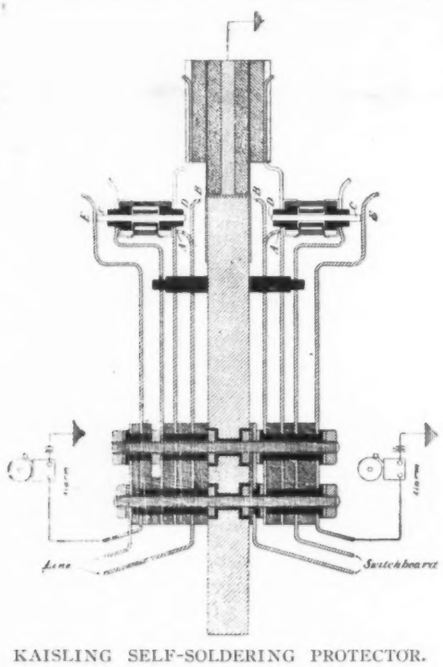
One of the most prosperous Independent telephone companies in Texas is the Texas and Pacific Telephone Company, with headquarters at Colorado, Texas. This company owns six exchanges and some 600 miles of toll lines, where six years ago there was not a telephone in the county. The little town of Colorado has a population of 2,000, and the company has 255 telephones connected there, an average of one to every eight people. Other exchanges owned and managed by the Texas and Pacific company are at Roscoe, Merkel, Snyder, Light and Sweetwater. The officers of the company are: President, J. N. Weakley, Roby; vice president, B. S. Van Tuyl, Colorado; general manager, Robert M. Webb, Colorado; auditor, Ernest Keathley.



THE KAISLING SELF-SOLDERING PROTECTOR.

William Kaisling, one of the best-known electricians and mechanics in the Independent telephone field, has invented a protector which bears his name, and has granted the exclusive manufacturing rights to the American Electric Fuse Company of Chicago. Mr. Kaisling's inventions have always been characterized by simplicity of construction, mechanical strength, and efficiency in operation. His protector is no exception to the rule. In fact, it has been pronounced by such competent engineers as Kempster B. Miller and Samuel G. McMeen, to be practically a perfect protector.

It has fewer working parts than any other protector made, and yet combines every element of a good protector. There are four springs on each side of every pair, making only eight springs in the entire protector circuit for both sides of the line. These springs open the line when the heat coil is operated, and at the same time send the dangerous current to ground. Simultaneously a local alarm circuit is closed;



KAISLING SELF-SOLDERING PROTECTOR.

thus, with the small number of springs used, accomplishing every desired purpose.

The Kaisling protector is a self-soldering device, but built upon entirely new lines, and different from any other self-soldering protector. The illustration will show the method of operation. The heat coil is made with a pin or bar of German silver, fastened with soft solder inside a copper spool, its ends projecting from each side of the spool, the outside projecting end being longer than the inner end. The heat concentrating coil is made of insulated resistance wire, wrapped around the spool, over the pin which is soldered inside the spool. Suitable terminal pieces and insulating bushings are provided so that the coil, when a normal current is passing, is held firmly in the containing springs. These springs make contacts with the terminal caps of the cartridge, to which the two ends of the heat coil wire, wrapped around the spool and over the pin, which is and the soft solder are not in the line circuit at any time; the pin being covered with an insulating bushing at each end, preventing it from making contact with the containing springs.

The method of operation is as follows: The pin "C," which is insulated from the line springs, makes contact at its outer end with the strong neutral spring "E." When an excessive current heats the coil, the solder holding the pin inside the copper spool is melted, allowing the strong spring "E" to force the outer end of the pin back into the spool. The other, or inner end of the pin, is forced out of the spool and against the inner line spring, striking it at point "D" and opening the circuit at point "A." The point "B" is also forced over to contact with ground. The circuit is thus opened and grounded by the operation of the coil. The pin is the only part of the coil that moves. A local or alarm circuit is also made through spring "E," pin "C" and ground.

The solder cooling, the coil is ready for use again by reversing it in the containing springs, the *inner* end of the cartridge now being put in the *outside* spring. Thus the pin by successive operations is forced back and forth through the copper spool resoldering itself each time.

The advantages claimed by the manufacturers for the Kaisling protectors are as follows:

"First.—The Kaisling excels in efficiency. This is due to the fact that the heat is entirely concentrated, and contained within the covering of the coil, which prevents radiation and loss. No other self-soldering heat coil is equal to the Kaisling in this regard.

"Second.—The Kaisling has less internal resistance than any other coil made and is more delicate and exact in operation than any other.

"Third.—External heat or cold have practically no effect on the operation of the Kaisling coil. The operating parts being entirely enclosed, gives it this advantage over all others.

"Fourth.—It has a practically unlimited life. Tests have been made in which the same coil has been operated over 2,000 times without any change or loss in efficiency.

"Fifth.—The Kaisling is the most compact protector made. A switchboard pair measures two and one-quarter inches in width. All protectors are mounted on half-inch centers.

"Sixth.—Every protector is tested out before being shipped, and its accuracy, efficiency and workmanship are absolutely guaranteed.

"These are a half-dozen of the many points of superiority presented in the Kaisling protector. A sample will disclose many good points which a description cannot cover.

"The Kaisling is an absolutely non-infringing protector. Patents have been applied for covering it fully, and its principal features are absolutely new. It is free, therefore, from any good or bad patent claims of any other manufacturers. In this respect, it is the only absolutely safe protector to buy. The American Electric Fuse Company will guarantee every one of its customers protection when buying and using the Kaisling protector. Samples will be furnished to intending purchasers."

S. E. COMPANY RECEIVER.

In a folder describing the S. E. Company's receiver, manufactured by the Spies Electric Company, 87 West Van Buren street, Chicago, the manufacturer says:

In offering the S. E. Company receiver we feel confident it has several particularly good and valuable features in addition to the general workmanship, which like all "Spies" products is undoubtedly superior to the average, and every bit on par with that of the foremost manufacturers of the day.

Referring to the particular features of the receiver simplicity of detail and effectiveness of the cumulation of the constituent parts as a whole is of course the salient feature; yet the little details, which like the works of a watch, determine its value, have had most careful consideration.

For example: The adjustment is unprecedented. With a slight relaxation of a screw, as readily accessible as is your lead pencil, the metal cup containing the coils is released, and may be turned so as to raise or lower the poles of the magnet in whatever direction adjustment is required. Resetting this screw clamps it positively to stay adjusted, and neither jar or fall can effect the adjustment, thus combining the good points of an adjustable instrument with that of

one of the solid or non-adjustable type. The metal cup may also be entirely removed, leaving all other parts intact, and with the cup removed, the coils stand free and open to inspection.

The entire internal mechanism is self-contained, and a change of shell is permissible without interference with the internal parts or the adjustment. All parts are assembled and fitted together in a mechanical, workmanlike manner, insuring permanency and effectiveness.

It is of pertinent interest to any and all buyers of this important adjunct of the telephone to become familiar with the S. E. Company receiver, and to facilitate its introduction we will mail a sample, postpaid, for $1.25 with electrose shell, or $1.50 with hard rubber shell, less a discount of 10 cents when cash accompanies the order.

SEVERE TESTS OF THE MILLER ANCHOR.

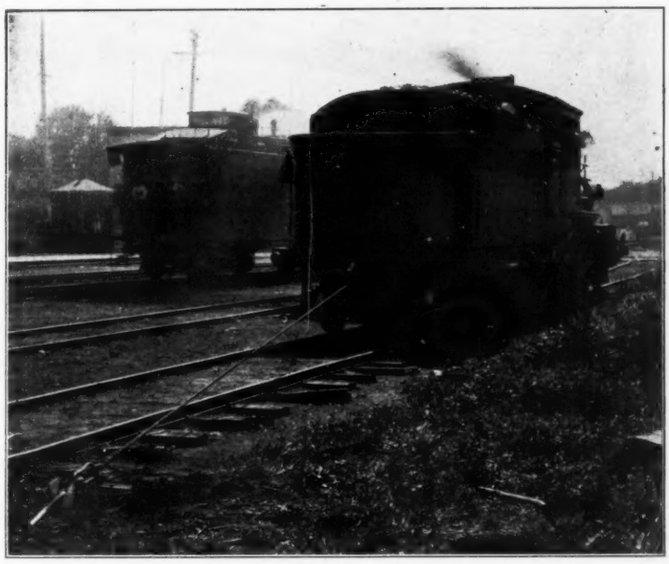
A severe test recently was given the Miller Anchor in the yards of the Wheeling & Lake Erie Railway Company at Norwalk, Ohio, where the factory and offices of the Miller company are located. G. H. Miller, president of the company, had set one of the large No. 6 anchors about eight feet deep, and J. F. Hill, the general foreman, had charge of the test to try to pull the anchor out. They used for this purpose engine No. 97, which has a traction pull of 18,273 pounds, and engine 108, which has a traction pull of 17,864 pounds, making a total tractive power of 36,137 pounds. This is somewhat more than one of the large compound engines can pull.

After repeated attempts by the engines it was found to be impossible to pull the anchor out of the ground. The time used in setting the anchor ready for the strain was but forty-five minutes. This anchor measured ten inches in width by thirty inches in length, fitted with a nine-foot rod one and three-eighths inches in diameter. The rod is supposed to stand a pull of about 80,000 pounds, and the anchor the same.

The accompanying illustration is from a picture taken while the test was in progress.

Another test was made in the L. S. & M. S. Railway yards in Norwalk. The Miller company installed one of its new No. 6 anchors—the same as was used in the above test—some eight feet in the ground. The engine selected for the test was an 80-ton engine, and was carrying 150 pounds of steam pressure at the time. The engine made three pulls on the anchor, and the last time it broke a coupling pin one inch in diameter and could not pull the anchor up.

These tests were given to determine the strength of the anchor for railway wrecking purposes, as all railway wrecking cars require something of this kind to enable them to do good work quickly. If there are no trees or anything of this kind to which to fasten a rope, an anchor must be used. The one great feature of the Miller anchors for this class of work is that they can be installed very quickly, which makes them very valuable to the railway companies. If this anchor meets with the approval of all companies, it will create a great demand for them, as all railway companies throughout the United States are in constant need



ENGINE TEST OF MILLER ANCHOR.

of something of this kind. The Miller Anchor Company is in position to fill all orders at once.

"They never pull up."

THE CLINTON STAMPING AND ELECTRIC COMPANY.

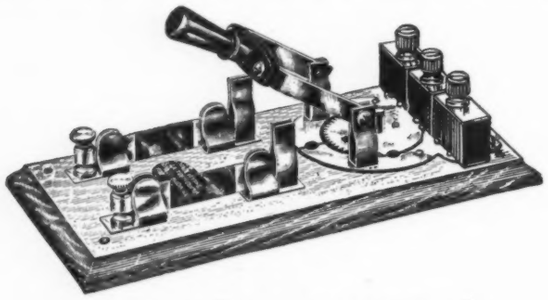
J. A. TORNQUIST.

J. A. Tornquist, president and general manager of the Clinton Stamping and Electric Company, is a young man, 30 years of age. He is very earnest in his efforts to supply the needs of the trade in this particular line of goods, and assumes a quiet and determined aspect in regard to his company's welfare. He is making a strong effort to get out only good goods and will try and prove that nothing better can be accomplished in the way of workmanship. This company is finding a ready sale for its goods, and Mr. Tornquist is always ready to do what is right by his patrons. It is safe to assume that the details of any business have not been more carefully and conscientiously investigated and studied by any individual than that of the Clinton Stamping and Electric Company by Mr. Tornquist.

The Clinton Stamping & Electric Company, Clinton, Iowa, manufacturers of the famous Tornquist combination lightning arrester, ground switch, fuse and lever cut-out, the "King of Protectors," which, the company claims, is demonstrating its superiority over all other styles and makes

of telephone protectors by the phenomenal sale it is having, has recently improved its factory in order to supply the great demand for this protector, also to make room for the manufacture of "Baby Knife" switches, which this company has just commenced to manufacture.

They are going to place on the market the highest class of goods in this line that is possible to produce and make prices

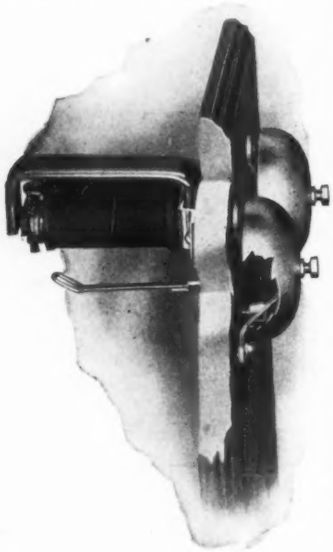


TORNQUIST "KING OF PROTECTORS."

so attractive that a large share of trade will accrue to them. Also with the end in view to make their product so good that a customer will specify "Clinton" goods in his future orders after once having seen them. They will be more than pleased to answer any inquiries in regard to their product and quote prices and send circular matter on the same.

MONARCH GONG DAMPER.

The Monarch Telephone Manufacturing Company of Chicago has recently added a new feature to its compact type telephone, which will be appreciated by both exchange men and subscribers. Almost every one using this common type of telephone has experienced the annoyance caused by the continued vibration of the ringer gongs after the receiver has been placed to the ear. The sensitive transmitters manufactured to-day take up the vibrations and magnify them to such an extent that conversation is impossible until the noise is stopped. It is usually the custom to place the hand on the gongs to deaden the tone, but the device of the Monarch company makes this unnecessary.



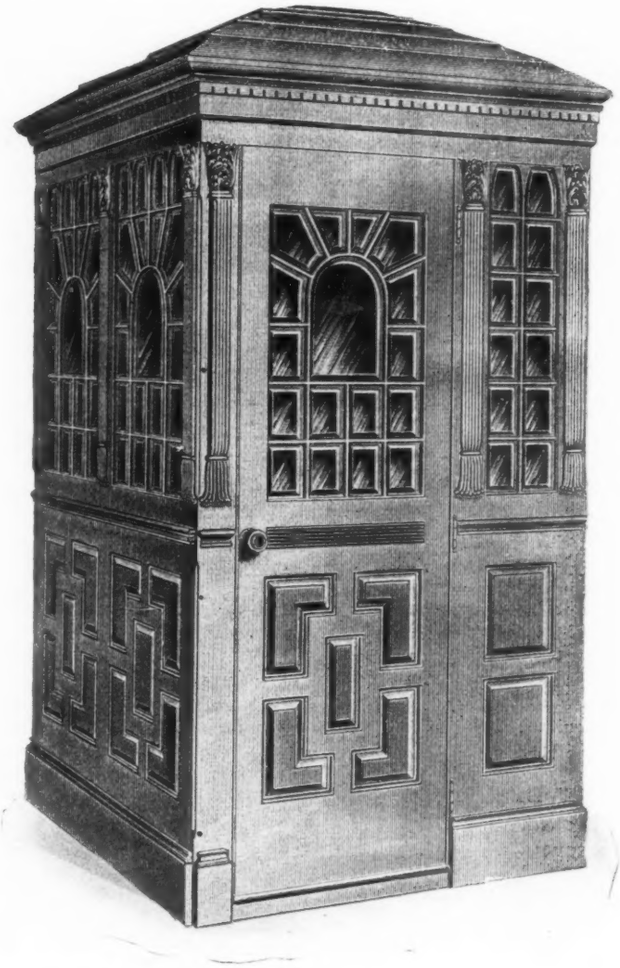
The accompanying cut shows the means of stopping the vibrations. As will be seen, a lever is fastened by hinges on the door of the telephone just below the ringer. When the door is closed, this lever rests upon the switch-hook so that the raising of the hook also raises the lever. Two prongs or forks of the lever extend through the door, one into the inside of each gong, and are equipped with leather discs on their ends. These discs are normally held away from the gongs, but the tilting of the lever by the removal of the receiver throws them down into contact with the metal and effectually stops further vibrations.

A patent has been granted to the Monarch company on this device and they are installing it in all of their compact telephones. No extra charge is made, notwithstanding the advantages derived, as it is the policy of this company to make their telephones as efficient and up-to-date as it is possible to produce them. A more complete description of this gong damper will be found in a bulletin now being prepared.

PORTABLE SOUND-PROOF TELEPHONE BOOTH.

In the accompanying illustration is shown one of the numerous portable sound-proof telephone booths manufactured by W. S. Seaman & Company, Milwaukee, Wisconsin, who have had twenty years' experience in this line of work.

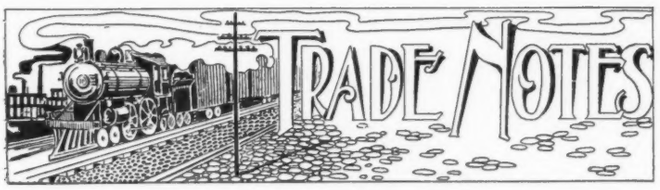
This booth has double walls. The inside and outside walls



PORTABLE SOUND-PROOF TELEPHONE BOOTH.

both extend to the floor on which the booth stands. The edges of the booth floor fit into grooves plowed crosswise of the inside walls. The inside walls are first put into position, the edges of the side walls fit into grooves plowed lengthwise of the front and back walls; screws draw them tightly together at the corners of the booth. The outside walls are put into position and fastened in the same manner as are the inside walls. The ceiling fits over the inside walls, the top over the outside walls, giving a clear air space on all sides and at the top. The floor rests on felt cushions. The outside and inside walls are held the proper distance apart by four small cushioned blocks at the extreme corners of each side. The door walls are separate, and swing on different sets of hinges, necessitating the use of an adjustable extension lock, which is supplied with each booth. Doors will be furnished as may be ordered, to swing to the right or left as may be most convenient to users.

The illustrated catalogue and price list of the company will be sent upon application.



THE CENTRAL ELECTRIC COMPANY, Chicago, publishes, for the month of September, a very attractive little desk calendar.

THE GEMMILL TELEPHONE MANUFACTURING COMPANY, Cleveland, has decided to locate in Orrville, Ohio, where it will erect a large plant.

THE INDIANA RUBBER AND INSULATED WIRE COMPANY, Jonesboro, Indiana, has presented some of its patrons with a handsome lithographed wall card bearing its advertisement.

THE S. H. COUCH COMPANY, Boston, has recently issued bulletin 8, describing their new desk set, No. 66. The company will gladly mail a copy to anyone requesting the same.

THE UNITED STATES RAILWAY SIGNAL AND TELEPHONE COMPANY has been incorporated at St. Paul with a capital of $1,000,000. James A. Ballard heads the list of incorporators.

THE ELECTRIC APPLIANCE COMPANY, Chicago, has just published two catalogues—No. 22 and No. 23—in which are illustrations and descriptions of the Eaco portable railway telephone.

THE MALTBY LUMBER COMPANY, Bay City, Michigan, has changed its name to the Maltby Cedar Company. The company is one of the most progressive pole and tie concerns in the field.

THE VOUGHT-BERGER COMPANY, La Crosse, Wisconsin, has been awarded a contract by the Barre Mills Telephone Company of Wisconsin for a switchboard with one hundred drops installed.

THE A. NEWBERGER ELECTRIC COMPANY, Brooklyn, has been incorporated. Its directors for the first year are as follows: Herman De Vos, Rentfro B. Banton and Banton Moore, of Brooklyn.

THE WALLSWORTH & NEVILLE MANUFACTURING COMPANY, Chicago, has purchased a nine-acre tract of land at St. Paul, Minnesota, and will erect a big plant for the manufacture of its products.

THE CENTURY TELEPHONE CONSTRUCTION COMPANY, Buffalo, New York, reports a rapidly increasing demand for its electrode transmitters, especially through the central and middle western states.

THE STANLEY ELECTRIC MANUFACTURING COMPANY, Pittsfield, Massachusetts, is distributing a map, showing the location of the S. K. C. systems of long-distance electric transmission in California.

THE OSBURN FLEXIBLE CONDUIT COMPANY, New York City, will mail on request its new price list of "flexduct." This price list also contains some interesting data concerning the use of "flexduct" for insulating purposes.

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Chicago, has recently closed a contract with the Royal Telephone Company of Front Royal, Virginia, for a switchboard and equipment. This company has also closed a contract with Ferensen & Crawford, Malone, New York, for switchboard equipment.

THE AMERICAN MELAPHONE COMPANY, Minneapolis, has filed articles of incorporation. Its capital stock is $50,000 and it will manufacture melaphones. H. P. Watson, Sumner F. Porter and D. L. Raymond are the incorporators.

THE CENTRAL ELECTRIC COMPANY, Chicago, is sending out circulars quoting prices on porcelain tubes and insulators. The company states that it is prepared to make prompt shipment and will present a most attractive proposition on correspondence.

THE RUNZEL-LENZ ELECTRIC MANUFACTURING COMPANY, Chicago, has completed the installation of its cable department. Preparations have been made to double the output of the cord department, this being necessary in order to supply the demands for cords.

THE ELECTRIC APPLIANCE COMPANY, Chicago, reports an unprecedented demand for its No. 36 X. P. type telephone. This is the instrument which the company guarantees, on a line equipped with twenty of them, to ring the twentieth with eighteen receivers down.

VINTON A. SEARS has sent us a handsome little booklet advancing the interests of the Automatic Telephone Equipment Company of Boston, Massachusetts. A guide to its contents is found in the title, "A Girlless Telephone Proposition." It is full of interesting matter pertaining to automatic telephones and will be sent upon application.

THE ELMER P. MORRIS COMPANY, New York City, has prepared a fine general catalogue descriptive of wrought-iron and steel tubular poles and pole brackets for electric railways, electric lighting, telegraph and telephone service. This company manufactures also a complete line of material used in the construction and operation of electric railways.

J. S. BARRON & COMPANY, New York City, are calling attention to a large line of telephone cleats which they carry in stock. These cleats are made in every size and style for telephone and telegraph service. The company also manufactures a strong line of fiber cleats for interior wiring of every description. Catalogue and prices upon application.

THE AMERICAN TRADING AND CONSTRUCTION COMPANY, Watervleit, New York, has placed an order with the Dean Electric Company for a complete exchange equipment for that city. The switchboard is for 1,500 lines and is of the multiple lamp signal type, arranged for four-party selective signaling, with indicating selective keys for each cord circuit.

THE AMERICAN ELECTRICAL NOVELTY AND MANUFACTURING COMPANY is distributing a very neat souvenir at the St. Louis world's fair. It is a catalogue in the shape of an incandescent electric light bulb containing numerous pictures and much information regarding the electrical novelties which this firm handles. It will be sent to anyone upon request.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, Illinois, is pleased to announce that it is now placing telephones on the market having a special constructed device to be used in lieu of a condenser, for the purpose of enabling rural lines to call any telephone—it matters not how many receivers are off the hook—along the line. The Eureka company also announces such improvements in its transmitter as to positively place this instrument in the front

rank of transmitters. They will be pleased to send any company interested a secret communication that they are sending out, entitled, "What a Transmitter Should Do, and How It Should Be Built."

THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, Rochester, New York, and Chicago, has recently closed contracts for switchboards with the following companies: Pfister Vogel Leather Co., Milwaukee; Davis & Means, Delmar, Iowa; Fayette County Telephone Company, Fayetteville, Texas; Shelby Telephone Company, Shelby, Missouri.

THE KNICKERBOCKER CONSTRUCTION COMPANY, New York city, has received a contract for the installation of the underground and aerial cables for the new Lewiston-Auburn, Maine, Automatic Telephone Company. The cable, which will be over 100,000 feet, is being manufactured by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, New York.

C. E. NICHOLAS of the Nicholas Lightning Arrester Company, Columbus, Ohio, has opened an office at Columbus to look after the cable work of telephone companies that do not keep a regular cable man. All companies that have cable work of any kind, such as repairs, locations of trouble, should communicate with Mr. Nicholas, who will be glad to give them all the aid he can.

THE AMERICAN CONDUIT COMPANY, New York city, has just been awarded the contract by the electrical commission of Baltimore for a quarter of a million feet of bituminized fiber conduit. This contract was awarded after a series of exhaustive tests and investigations, which forms another important link in the chain of evidence favorable to bitumized fiber conduit for underground construction.

THE EAGLE GENERATOR COMPANY, St. Louis, is mailing to the trade a neat circular printed in colors and advertising their "Eagle" water-feed generator. The circular is unique in the extreme, as after each of a score of statements made by the company is a picture of an owl, which makes some very apt comments on the "Eagle" generator. The circular should be seen and read to be appreciated.

THE FOX-CALLAHAN PHONEALARM AND ELECTRIC SUPPLY COMPANY, Milwaukee, a comparatively new company, conducted by a number of young men of Milwaukee, has elected the following-named officers for the ensuing year: President, B. O. Fox; vice-president, T. E. Callahan; secretary-treasurer, W. J. Delaney; board of directors, George D. Tibbits, W. J. Delaney, T. E. Callahan and B. O. Fox.

THE KESTER ELECTRIC MANUFACTURING COMPANY, Chicago, has a very unique exhibit at the World's Fair, St. Louis. It is a clock 7 feet 5½ inches high, made exclusively of ordinary pins joined with Kester Self-Fluxing Solder. Over 15,000 pins were used in its construction, and it weighs 40½ pounds. F. G. Dickerson, secretary of the company, designed and executed this remarkable piece of work.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY, New York City, has just issued Catalogue No. 18, with net trade price list. It is a portly volume of no less than 640 pages, and is in itself a compendium of the electrical arts, every branch of which finds a place. Details and illustrations are given copiously of all classes of goods, a great many of which are of the company's own manufacture and are its well-known exclusive specialties. At the end of the book are views of the headquarters in New York and Chicago and of the big factory in Jersey City, with 100,000 square feet, where 500 employes make nearly 1,000 different electrical articles.

THE CENTURY TELEPHONE CONSTRUCTION COMPANY, Buffalo, New York, has issued pamphlets describing switchboard protectors, distributing frames, lightning arresters, fuse blocks and combined cut-out switches. Particular attention is given to the description of self-soldering heat coils, and also to the distributing frames designed for this class of arrester. Copies of these pamphlets will be sent on request.

G. M. GEST, the expert subway contractor, has been awarded the contract for the complete installation of an underground conduit system, including all the electrical distribution to service and house connections, for the South Bend Electric Company, South Bend, Indiana. This work covers all of the main streets of that city and will be one of the most complete and modern conduit systems so far constructed, it is said.

THE CHICAGO TELEPHONE SUPPLY COMPANY, Elkhart, Indiana, has offered to install a complete telephone system in the city of Brantford, Ontario, for $37,500, the system to include 500 telephones, with an ultimate capacity of 1,000, and the entire plant to be of the best construction, including an underground system in the business portion of the city. It is understood that there is strong feeling in favor of accepting the proposition.

THE W. G. NAGEL ELECTRIC COMPANY, Toledo, Ohio, is now putting on the market a very high quality of cable compound, known as the "W. D. Insulating Cable Compound." This cable compound combines all the essentials of a perfect insulating compound, chief among which is perfect insulation and an extremely high melting compound. To telephone companies desiring perfect insulation the company recommends its use.

THE MILLER ANCHOR COMPANY, Norwalk, Ohio, reports a constantly increasing demand for its anchor. These anchors have been on the market only a short time, but their merits, size, strength and cheapness have brought them into the favor of all who have use for a good anchor. They are being specified by some of the largest and best companies. A bronze miniature of the anchor and a catalogue will be promptly mailed on request.

THE CROCKER-WHEELER COMPANY, Ampere, New Jersey, received recently the following interesting letter from a Japanese engineer: "I beg you please to send me a copy of your precious catalogue, which I have a great interest, as I shall commence some trifling business for the electrical engineering in after a few months. If you favor it for me I should be in great thankfulness." It is needless to say that the catalogue was forwarded by next mail.

THE EUREKA ELECTRIC COMPANY, Chicago and Genoa, Illinois, has now in press a telephone work containing valuable information, statistics, and data that will be of value to every telephone man, which will be ready for distribution September 1. The work is entitled, "Independent Telephone Practice," and was compiled by I. J. Kusel and A. E. Dobbs, two of the best known telephone men in the Independent field. The work will be distributed by the Eureka Electric Company, and will be sent upon application.

THE EWING-MERKLE ELECTRIC COMPANY, St. Louis, is mailing to its customers "War Bulletin No. 1," reciting the merits of the No. 16 Acme dry battery, which it claims is the most powerful battery of its sort manufactured. It also calls attention to "Security" electrical goods, the "Ever

Ready" electric vest pocket light, "Diamond H" flush receptacle and plug, porcelain tubes, knots and cleats, Edison plug cut-outs, and other specialties which it handles. For further information write the Ewing-Merkle Company.

THE CRYSTALLIZED CARBON COMPANY, Chicago, manufacturer of strictly high-grade granular carbon for telephone transmitters, guarantees this carbon to hold its life and efficiency indefinitely. It has been in use for more than five years by the leading manufacturers, and the company states that not once in all that time has it received a complaint. The company will send a sample to anyone writing for same and stating size used in transmitter. Further information and prices will be furnished on application.

THE DEUTSCHE WAFFEN UND MUNITIONS FABRIKEN, Berlin, Dorotheen Str. 43-44, in a catalogue just issued, describes the Strowger automatic telephone system, a full account being given of the details of construction and operation of the calling apparatus and the substitute employed for the central girl. The features of the automatic selective interconnecting sets at the exchange are fully covered, illustrations of the 6,000-set installation at Dayton, Ohio, being given as showing an equipment in successful operation.

THE LOCKE INSULATOR MANUFACTURING COMPANY, Victor, New York, has placed a contract with Prof. H. B. Smith of the Worcester Polytechnic Institute, Worcester, Massachusetts, for a 200-K. W. 300,000-volt transformer, which will be the largest very high-potential transformer ever built, though its voltage will be less than that which has been used at the Polytechnic for experimental purposes. The transformer will be built in the institute shop, which, as is well known, is a successful commercial enterprise.

THE INDIANAPOLIS ARM, BRACKET & PIN COMPANY, Madison, Indiana, has recently made important additions to the facilities of its big plant. A number of automatic machines have just been installed and the plant is now able to fill all orders promptly. The factory has the advantage of unexcelled shipping facilities and is located where it is able to secure the finest supply of raw material to be obtained anywhere. J. B. Magers, one of the most experienced men in his line of business in the country, is manager of the company.

FRANK B. COOK, Chicago, reports that some of the many large exchanges which have been equipped with his No. 44 protectors are the Citizens' Telephone Company of Grand Rapids, Michigan, 5,425 pairs; Home Telephone Company of Dayton, Ohio, 6,000 pairs; Northeastern Telephone Company of Portland, Maine, 2,500 pairs; Home Telephone Company of Kansas City, Missouri, 2,060 pairs in exchange A, 1,440 pairs in exchange B, 1,640 pairs in exchange C; Utah Independent Telephone Company of Salt Lake City, 4,100 pairs.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, is having for this time of the year an exceptionally good demand for their small village exchange and rural country party line apparatus, having recently secured, outside of their regular trade, contracts for equipment for Holdredge, Nebraska; South McAllester, Indian Territory; Fayetteville, Winamac and Grass Creek, Indiana; Pierre, South Dakota; Svea, Minnesota; Malvern and Tabor, Iowa; Baldwin, Kansas; Devine, Texas, and Hartland, New Brunswick.

R. W. KEMP, who for some time has been with the Missouri & Kansas Telephone Company of Kansas City, Missouri, has resigned his position with that company and will open an office in Wellington, Kansas, as consulting and contracting telephone engineer, confining his territory principally to Kansas, Oklahoma and Indian Territory. Although Mr. Kemp is only 24 years of age he has spent eight years in the telephone business, having worked in every capacity, thus giving him an excellent knowledge of the business which he is entering.

THE BAIRD MANUFACTURING COMPANY, Chicago, has just received a letter from the Hawaiian Islands, where its pay stations were recently installed. E. B. Carley, treasurer and superintendent of the Maui Telephone Company of Paia, has this to say of the Baird pay stations: "I must say that they are a great financial surprise to me, as well as to the directors of our company; they work like a charm." The Baird company has also received a large order from the Independent Telephone Company of Seattle, Washington, for its three-slot pay stations and a time stamp.

THE FARR TELEPHONE CONSTRUCTION COMPANY, Chicago, reports a large increase in business. During the first week of August, orders were received from Mexico, Ontario, British Columbia, New York, Virginia, Kentucky, Nebraska, Michigan, Nova Scotia, Wisconsin, Minnesota, Tennessee, Washington, Illinois, South Dakota, Indiana, Colorado, Ohio, Iowa, Missouri and Texas. The company has also recently gotten up a catalogue which describes its various types of switchboard, magneto instruments, desk sets, extension bells, wire tools and accessories. This catalogue will be mailed upon request.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, reports an increasing demand for its never failing self-restoring drop switchboard, and also for its various types of telephones, including the four-party selective equipment. Recent installations made by this company in Indiana were the switchboard and equipment for the Daleville Telephone Company, Summitville Telephone Company, Medford Home Telephone Company, and Frankton Telephone Company. These exchanges are equipped throughout with International express type or mechanical self-restoring drop switchboards, International series exchange and four-party line selective telephones.

THE NORTH ELECTRIC COMPANY, Cleveland, gave its employes a day's outing on August 27, when a picnic and field day exercises were held at Silver Lake, which was largely attended by the employes, their families and friends. The amusements included races, baseball, dancing, boating, bowling, etc., and a general good time, and the several hundred persons who participated in the festivities enjoyed themselves every minute of the day. TELEPHONY'S staff acknowledges an invitation to attend and regrets that it could not be represented at the outing. The North Electric Company is to be commended for the interest it takes in its employes and for its efforts to make their yearly picnic a success.

JULIUS ANDRAE & SONS, Milwaukee, have recently issued their catalogue No. 11, which deals very thoroughly with the switchboard apparatus, telephone accessories and construction material manufactured by this company. Particular attention has been given to the design of the various pieces of apparatus, all of which carry a first-class guarantee. The company claims to spend more money on its assembly than any other manufacturer, and has acquired the reputation of sending out nothing but perfect apparatus. All the cabinet work is taken from selected stock and skillfully put together. Wiring connections are made in the very best possible manner, and every precaution is exercised in the testing of the apparatus. Particular attention is drawn to the giant generators, which the company claims to be the most powerful on the market. Various types of switchboards are thoroughly described, together with the four-party selective sig-

naling system, which this company advocates. This catalogue should be in the hands of every telephone manager and will be sent upon request.

THE STERLING ELECTRIC COMPANY, Lafayette, Indiana, has just completed a large export order for London, England. This company reports a steady growth in export business. The Sterling company, in addition to its pole boxes, and outside terminals, has added to its line of manufacture an iron pole seat, which should meet with favor with construction people. The four-party line selective equipment manufactured by this company is gaining popularity daily. Shipments have just been made to Springville, Hudson and Cooperstown, New York; Meadville, Warren and Conneaut, Pennsylvania; Cedar Rapids, Iowa; Chillicothe and Lorain, Ohio; Louisiana, Missouri; Pittsburg, Kansas.

THE ANDERS PUSH BUTTON TELEPHONE COMPANY, New York city, has had a petition in bankruptcy filed against it by Henry W. Sykes for the creditors. The company was incorporated November 21, 1901, as the American Push Button Telephone Company, with a capital stock of $300,000, and the name was changed to the present style in May last. Considerable money was spent on developing the instruments of the company. Mr. Sykes says that the liabilities exceed $15,000. The assets consist of stock, materials, machinery and fixtures, $4,500; outstanding accounts, $2,000, and patents, value unknown. Judge Thomas has appointed Joseph H. Adams receiver, on the application of W. J. Murdock & Co.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, which has furnished the equipment for nearly all of the Independent exchanges in the Canadian provinces, has been awarded the contract to furnish the entire apparatus, appurtenances, construction material and a large amount of lead-covered pipe by the town of Neepawa, Manitoba, which is installing a modern telephone-exchange system, which will furnish both local and urban service to a large list of subscribers. In common with the policy adopted by a number of Canadian cities and towns, the plant will be controlled and operated by the municipality, and it is intended to afford the patrons a thoroughly up-to-date service.

THE CONNECTICUT TELEPHONE AND ELECTRIC COMPANY, Meridan, Connecticut, reports a large sale of its weather-proof iron box telephones, which it has especially designed for mine, street railway and police service. It has also placed on the market several new styles of toll line switchboards, which are specially designed for heavily loaded lines. The company further reports a large sale of its automatic intercommunicating telephones, which are now arranged for branch office exchanges with connection to city service and are adapted either for connection to local or common battery systems. The company has also placed on the market a new type of its five-bar telephone, which is equipped with non-interfering ringing device. Illustrative and descriptive matter of the above apparatus will be sent on request.

THE FALLER AUTOMATIC TELEPHONE EXCHANGE COMPANY, New York city, is distributing to the telephone fraternity throughout the country some highly interesting advertising matter in the way of booklets and circulars setting forth the merits and advantages of the Faller automatic and semi-automatic telephone systems. By the aid of illustrations and notes the invention is explained in minutest detail and made clear even to those not familiar with telephone construction. The description is intended to give telephone men some idea of what can be accomplished by this system in giving to the public a rapid, accurate and absolutely private service. It is also meant to convey an intelligent idea of the savings in construction, operation and maintenance which can be effected by the system. The Faller company will be glad to furnish printed matter upon application.

THE DEAN ELECTRIC COMPANY, Elyria, Ohio, has been awarded the contract by the Exchange Construction Company of Johnstown, New York, for a complete central office equipment for Plattsburg, New York. The switchboard is for 1,500 lines with lamp signals and multiple equipment. It is to be provided with Mr. Dean's latest metallic circuit four-party selective ringing system, with indicating ringing keys in each cord circuit. These keys operate only two contacts in the talking circuit, the same as the standard single ringing key and all the talking contacts for a position are in plain view upon opening the hinged key shelf. Heretofore, eight to ten such contacts were necessary in each four-party key. Every detail of the complete installation has been carefully worked out along advanced ideas of design and operation.

THE STERLING ELECTRIC COMPANY, Lafayette, Ind., has secured the contract to furnish the Standard Oil Company of Albany, New York, with one of its latest type of private branch switchboards. The Sterling company is furnishing its different types of protective device to the following points: Newton, Illinois; Sparta, Wisconsin; Hoosick Falls, New York; Chester, New York; Columbia, Missouri; St. Louis, Missouri; Atlantic, Iowa; Kansas City, Missouri; Indianapolis, Indiana; Portland, Indiana; Deposit, New York; Lyons, Iowa; Tiffin, Ohio; Columbus, Ohio; Crosswell, Ohio; Utica, New York; Vassar, Michigan; Atlanta, Georgia; Lincoln, Illinois; Bay City, Michigan; Papillion, Nebraska; Sheboygan, Wisconsin; Novinger, Missouri; Cairo, Illinois; Columbus, Indiana; Neosha, Missouri; Lincoln, Nebraska; Birmingham, Alabama.

THE AMERICAN ELECTRIC FUSE COMPANY, New York city, Chicago and Atlanta, Georgia, manufacturer of the Rolfe-American switchboard protectors and main distributing frames with self-soldering heat cartridges, is sending out circulars calling special attention to its No. 402 protector, which it sells for fifty cents and describes as follows: "It's made to be used outside; the dome and bracket are galvanized and will not rust; the base is of porcelain; large carbon surface for lightning arrester; it is self-cleaning; the dust falls out at the bottom; the wires enter from the bottom through binding posts; it can be placed at the pole or on the side of the house; a good thing for toll line, farmer line or city subscribers; it meets the underwriters' approval; weather does not affect it; easy to place and neat in appearance when up; it's new, strong and practical; lasts a lifetime—you can't wear it out; send for a sample at once—try it and be convinced; the more you use, the more you'll want; this is no lightning rod scheme—it's the real goods; get your orders in early and avoid the rush." The company is also sending out a breezy fable on the George Ade order, entitled "A Chunk of Protector History; or, The Sad Story of a Genius Who Went Wrong." This will be mailed to anyone upon request.

FRANK B. COOK, Chicago, has been meeting with most flattering success with his No. 444 protector, which is equipped with self-soldering heat coils. This protector is manufactured under Mr. Cook's own exclusive patents, and it has been giving the best of satisfaction to the many companies that have installed it. Some of the recent shipments of complete distributing frame equipped with No. 444 protectors have been those to the Pittsburg and Allegheny Telephone Company, for their Homestead (Pennsylvania) exchange, a frame equipped for 600 lines, with an ultimate capacity of 700 lines; the United Telephone and Telegraph Company of Pittsburg, a frame equipped for 100 lines, with

an ultimate capacity of 200, for their exchange at Lewisburg, Pennsylvania, and a frame with a capacity of 100 lines for Norristown; the Milton & Milton Junction Telephone Company, a frame with a capacity of 100 lines, for their exchange at Milton Junction, Wisconsin; the Yuma Telephone Company of Yuma, Arizona, a frame equipped for 105 lines, with an ultimate capacity of 200 lines; the Sabine Valley Telephone Company of Center, Texas, a frame equipped for 200 lines, with a capacity of 300 lines; the Kentucky and Indiana Telephone Company, of Owensboro, Kentucky, an ultimate capacity of 1,300 lines, equipped for 1,260; the Albemarle Telephone Company, of Charlottesville, Virginia, an ultimate capacity of 300 pairs, equipped with 100.

"TELEPHONE PRINCIPLES AND PRACTICE."

George Walker Wilder, Ph. D., assistant professor in electrical engineering, Armour Institute of Technology, Chicago, is the author of a new book on the subject of telephony, entitled "Telephone Principles and Practices." It is an elaborately gotten up work and covers the subject in a most comprehensive manner. The author sets forth in a concise, clear and attractive way the principles of telephony, making plain each feature and giving the reader remarkable insight into the subject in all its varied phases. In the preface Prof. Wilder says:

A demand has arisen on the part of those who are about to engage in, or are already interested in, the telephone business, for greater knowledge of the principles of telephony and their applications to the problems encountered in practice. The old prejudice, widely entertained, that telephony presented problems too complicated for the comprehension of the ordinary layman has long been dispelled and the present time sees millions of capital invested in a business the success of which depends upon men who, like others who have become successful in life, have obtained their special knowledge through observation, experimentation and the application of good, common sense to their work.

The purpose of the book is an exposition of the fundamental principles of telephony and their application to telephone apparatus as designed, manufactured and operated to-day. The matter is divided into four sections, viz.: fundamental ideas; telephone apparatus; systems of communication; construction and equipment. The first section embraces those principles of physics and electricity essential to understanding the construction and operation of telephone circuits. The second relates to the details of subscribers' instruments. The third section treats of party lines and the management of small exchanges belonging to the generator call or local battery type. The fourth section deals with the construction of small exchanges, party and toll lines, their electrical properties and their protection against lightning. Except in certain cases where the author has made use of diagrams and ideas which have been found helpful in the classroom, no particular originality is claimed. Contemporary literature has been drawn upon freely whenever it was thought that by so doing the usefulness of the book might be increased.

In size the book is 450 pages and has 375 illustrations. Price, $2. Cantwell Printing Company, Madison, Wisconsin, publishers.

TELEPHONE COURTESIES.

Have you ever noticed, gentle reader, how few people ever observe the little telephone courtesies? Your bell rings and you put the receiver to your ear and someone whom you do not know, or never heard of, maybe, bellows at you: "Who is that?" It has always appeared that the one who calls up a party should first declare her identity or his name, and then ask whether the person at the other end is the required party. It is a simple rule, if you wish, but it is perfectly logical and shows good manners. If a man comes and calls on you and he is a stranger, does he not first say who he is; in other words, introduce himself? And so with the telephone. Every person likes to know to whom he or she is talking, especially when a volley of questions is shot at one. This may be a very small thing, but it may be just as very small for one to simply not reply, hang up the receiver and ring off. One courtesy is worth another. Courtesy is the pepper and salt of the seasoning of ordinary daily life.

MAY BE CRUCIAL TEST.

Speaking of the strike of the telegraphers on the Missouri, Kansas & Texas Railroad and the question of using telephones by which trains may be operated in case the key manipulators quit their jobs, the Lincoln (Neb.) *Journal* says:

Not a few railroad men in this city are watching with much interest the progress of the strike of telegraphers on the Missouri, Kansas & Texas road. Those well informed say this may be a crucial test which in the future will decide whether a railorad can operate its trains successfully by telephone, and if it can the days of the telegraph operator with his slow method of transmitting and receiving information by which trains are moved may be numbered. The successful operation of Katy trains for any considerable period by telephone will mean that the telegraphers' organization is no longer a factor, while a failure to so operate the road will immeasureably strengthen the organization in its dealings with other roads.

No one doubts that trains can be moved on orders transmitted by telephone, but whether they can be operated safely, whether the order transmitted by telephone involving numbers, time and names can be relied upon is the question. Of course the Katy has a number of operators at work and the number employed will increase from time to time, and trains on the main lines will probably be handled by the telegraphic order. The branch lines will be operated by telephone until the operators can be secured.

"In an incredibly short time the lines of the Burlington in Nebraska could be tied to headquarters with telephone wires," said a railroad man. "The Burlington, like all the larger systems, has many telephone lines in service on its system. Its electricians understand the installation of telephones. It has a telephone department of its own. In the event of a strike it would move trains. There might be delays, numerous and exasperating in the beginning, but trains would be moved and moved safely, too. The modern railroad prepares for trouble before it comes, and it is the state of preparedness for overcoming difficulties that sometimes wards off trouble. In my opinion, telegraphers make a great error when they tempt fate by striking now."

ELECTRIC WIRES AND FIRE RISKS.

In almost all telephone and telegraph offices, and in many electric lighting and railway plants located in regions traversed by high-potential transmission circuits, the chances of fire through the crossing of low and high voltage wires are so great as to warrant a most careful investigation of the situation by a skilled engineer, says S. H. Bunnell in the *Engineering Magazine*. This is an outcome of the rapid multiplication of power circuits throughout the country in the development of the long-distance transmission of electrical energy at potentials ranging from 5,000 to 60,000 volts. Special overhead construction for the prevention of such crossings is now being installed at many danger points, but the work has hardly been begun as yet. A high-tension "cross" on a low-tension line may easily start fires at many widely scattered points, to say nothing of the risk to human life.

Ordinary protective devices in the way of fuses, automatic cutouts and circuit breakers are usually effective up to 5,000 volts, but beyond this potential the only safe course appears to be the absolute prevention of any contact whatever between circuits which literally carry "chained lightning" and those of lower pressure. The latest rules of the National Board of Fire Underwriters are suggestive in detail as to how to avoid these serious dangers.

IN THE RURAL LINE DISTRICTS

Now prepare for the first note over the Tyron telephone.—*South Watertown Items in Watertown (Minn.) News.*

New telephones at Osakis work so well you can hear the rooster in the back yard crow.—*St. Paul (Minn.) News.*

The telephone line at the Crossing isn't in working order yet.—*Baker's Crossing Bits in Elyria (Ohio) Reporter.*

Miss Leona Officer is in Emporia in a telephone office learning the art.—*Reading Ripples in Emporia (Kan.) Gazette.*

Everybody will connect with the telephone line. But you mustn't gossip or quarrel over the line.—*Watertown (Minn.) News.*

Many new 'phones are being put in. Everything is coming our way now.—*Platte Bottom Pickings in Ashland (Neb.) Gazette.*

Evy Bugbee has his telephone in. Others will be in as soon as the weather permits.—*Boston Brevities in Emporia (Kan.) Gazette.*

Mr. Cusic and Mr. Kennedy have put in 'phones and now there will be more of us "rubber necks."—*Highland Hints in Dwight (Ill.) Star-Herald.*

Mr. Kinney is putting in the telephone boxes and now we will feel more like one great family.—*Louisville Lisps in Menominee (Wis.) Times.*

The hello 'phone is in working order now and the wires are kept hot communicating sense and nonsense.—*Bartley Breezes in McCook (Neb.) Tribune.*

The telephone is the center of attraction for the natives of this neck o' the woods just at present.—*Magnolia Musings in Newkirk (O. T.) Journal.*

Both ends of the Logan-Freeman telephone system are in working order. Stop your rubbering, Eld. Dubois; don't Buttinsky.—*Dickens Doings in Spencer (Ia.) Reporter.*

Our genial treasurer has got his telephone in now and is looking for a hello girl to tend the telephone while he digs the ducats out of the harvest field.—*Elk Run Etchings in Lanesboro (Ia.) News.*

Emerson has a telephone war on between the Clark Automatic and Home Telephone companies and talk is about the cheapest thing in that town—it's free at present.—*Dakota City (Neb.) Eagle.*

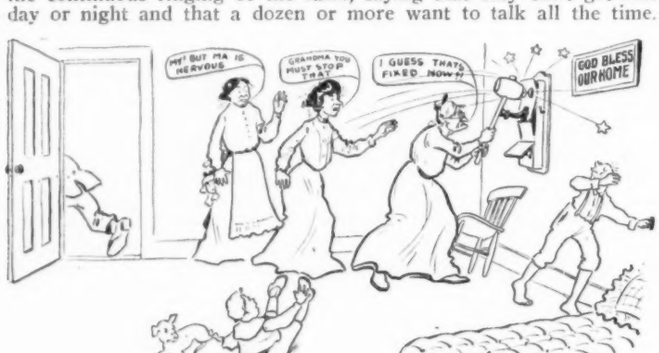
William Molt, the manager, reports still another batch of eight new orders for 'phones at the Milan exchange. It will perhaps be noticed that talking is 'way ahead of any other branch of business in town.—*Milan (Ohio) Advertiser.*

The storm Monday afternoon blew down a large tree to which the telephone wires were guyed, tangling them so that our telephone service for a short time was a bewildering puzzle that beat "Ann's age."—*New Bloomfield (Mo.) News.*

A crew of men is at work on the Roberts Telephone Company's territorial lines east and southeast. They will be partly rebuilt and the balance repaired, so that one may hear a smile from one end of the line to the other.—*Abilene (Tex.) Reporter.*

Mt. Pleasant has an almost through telephone line at last. If it was extended one more mile north and take in J. W. Gordon, the line would be completed from southeast to northwest Mt. Pleasant. Ladies, don't listen.—*Mt. Pleasant Mites in Horton (Kan.) Headlight.*

Those who have put in telephones lately are complaining about the continuous ringing of the same, saying that they can't get rest day or night and that a dozen or more want to talk all the time.



One old lady became nervous and broke the bell to stop the noise. The company compelled her to pay for it, and now she wants the blamed thing put out of the house.—*Grand Island (Neb.) Independent.*

Fred Krum, who is holding down a good position in a telephone company in Kansas City, made a Fourth of July visit to his parents, Mr. and Mrs. Dan Krum, and Miss Dollie was happy.—*Girard Rural Route No. 3 Items in Girard (Kan.) Press.*

More telephones have been put in lately. This neighborhood is well lined up now. If you once have one put in you will wonder how you ever got along without it. As seen from our point of view there is one disadvantage, however. There is no longer any excuse to call on your neighbor, not even Sunday evenings.—*Spencer (Ia.) Herald.*

Mrs. W. R. Rice of Columbus spent Wednesday in town and

I JUST LOVE CARAMEL CAKE
GIRLS HERE'S SUTHIN NICE FOR YOU
OH GOODY!
AIN'T HER RIG LOVELY
WHAT A SWELL BOUQUET
I WONDER WHATS UP

made the Twentieth Century telephone girls a present of a large bouquet and a caramel cake.—*Warrensburg (Mo.) Star.*

All arrangements have been made to extend the Coos River telephone line up the north fork as far as there are any farmers who will subscribe for telephones. This is a good move in the right direction and as the telephone is a thermometer of business it goes to show that times in Coos County are better than ever.—*Marshfield (Ore.) Mail.*

Tilleda will soon be able to say "Hello, Tiger!" through the telephone by way of Caroline, farmers living between Tigerton and Caroline having already commenced extending the line Tigerward. Such progressive actions on the part of the people speak well for the enterprise and industry of the country.—*Tilleda Tattlings in Tigerton (Wis.) Chronicle.*

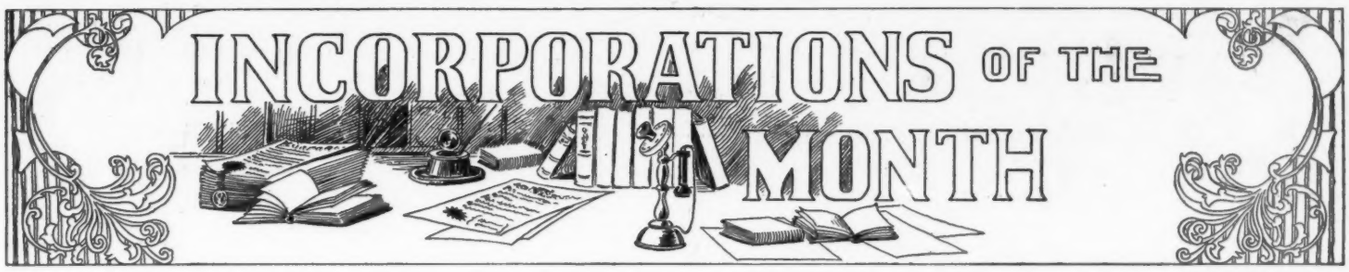
There is a great deal of kick coming from stockholders of the Gordon telephone line against patrons having their receivers down and holding concerts over the line. One of the stockholders and business men complains that he can hear roosters crowing whenever he takes down his receiver to transact business over the line.—*"Bob" in Osakis (Minn.) Review.*

The telephone comes in handy in more ways than one. Last Saturday afternoon W. C. Hoyt, who lives near Oak Grove school house, was in town and his wife telephoned him that his bees had swarmed and were hanging on the limb of a tree. He telephoned J. W. Coons, a neighbor, and had him go over and hive the bugs for him.—*Laddonia (Mo.) Herald.*

Mr. Parker of Gladbrook was around here last week putting in 'phones for the Amity Mutual Telephone Company, but as the poles have not arrived there is not much talking going on except in the south part, where William Neil's, A. Uhlenberg's, Dan Harrison's, George Paton's and John Stearns' are connected by barb wire fences and they are having a good time among themselves—*Traer (Ia.) Star-Clipper.*

Our citizens can have but little idea how the telephone exchange has been increasing. There are now nine operating girls in the Longmont office, and on July 11 there were 4,629 telephone calls. When you get impatient and do not get instant response remember it may be a new hello girl doing her best, but still inexperienced, for it takes about a year or year and a half for a girl to become a good operator, and then they up and get married and some new hand must learn. This is a sad world.—*Longmont (Colo.) Ledger.*

While Dr. and Mrs. Steele were gone to the fair a swarm of bees found some means of entering the front room of their residence and finding the Dr's. telephone proceeded to confiscate that instrument as an abiding place. Mrs. Moore, who was tending Mrs. Steele's flowers while she was away, discovered them and immediately called S. M. Bennett, who brought a hive and put them into it. The bees settled themselves down to business in their new abode and are at present gathering the sweets of nature.—*Lucerne Correspondence in Unionville (Mo.) Journal.*



ALABAMA.

COLUMBIANA—White and Davis Telephone Company. Capital stock, $10,000. Directors, W. P. White, W. F. Davis and others.

CALIFORNIA.

PETALUMA—The Vallejo Township Telephone Company. Capital stock, $5,000. Directors, John Caltoft, William Evart, G. W. Ormsby, Henry Graeff, J. R. Denman.

RIVERSIDE—Home Telephone and Telegraph Company. Capital stock, $500,000. Incorporators, John Van Liew, F. W. Wachter, D. F. Boyce and Arthur Wright of Los Angeles.

IDAHO.

BLUE LAKES—Twin Falls Telephone Company. Capital stock, $15,000. Incorporators, I. B. Perrine, R. M. McCollum, Silas Perrine, H. H. Jacobs.

ILLINOIS.

ALBION—The Edwards County Mutual Telephone Company organized. Capital stock, $8,000.

EDWARDSVILLE—The Troy Telephone Company. Capital stock, $10,000. Directors, J. H. Steinhaus, J. E. Gornet and others.

OCOYA—Eppards Telephone Company. Capital stock, $2,500. Incorporators, W. E. Fisk, W. W. Osborne, W. W. Wagner.

ST. JOSEPH—St. Joseph Telephone Company. Capital stock, $18,000. Incorporators, N. C. Hoyt, U. G. Glasscock, O. C. Biggs.

FARMINGTON—Farmington Telephone Company. Capital stock, $1,000. Incorporators, J. W. Connelly, F. S. Vandersloot, A. H. Fash.

LAWRENCEVILLE—The Star Line Telephone Company. Capital stock, $100,000. Incorporators, H. H. Knippe, J. S. Abbott, A. L. Maxwell.

BELVIDERE—Boone County Rural Telephone Company. Capital stock, $2,500. Incorporators, Fred W. Plane, D. W. Barningham, H. S. Hicks.

CEDARVILLE—S. W. Roberts, S. F. Newhall and H. M. Fisk have formed a corporation which will construct a telephone system in this place and throughout Stephenson county. The company is capitalized at $7,000.

INDIANA.

EKIN—Ekin Mutual Telephone Company. Capital stock, $12,000. Incorporators, William Price, W. F. Small and N. H. Lithicum of Atlanta.

CYPRESS—The Cypress Telephone Company. Capital stock $2,500. Directors, John F. Edmond, John A. Neale, Edgar S. Long and others.

MAJENICA—The Majenica Telephone Company. Capital stock, $2,000. Incorporators, Sherman Sprowl, George W. Gill, J. F. Hoover, Daniel Shideler, C. W. Myers.

IOWA.

CALUMET—Erie and Calumet Telephone Company. Capital stock, $1,000. Incorporators, Herman Reimers and others.

GRANVILLE—The Granville and Remsen Telephone Company. Capital stock, $2,000. President, J. F. Kriege; secretary, P. H. Krohnke; treasurer, P. N. Hanson; directors, Mat Hanson, John Towsfeldt, John R. Dornbusch, Henry Sauer.

HARTLEY—The Grant and Omega Rural Telephone Company. Capital stock, $4,000. President, C. A. Magee; vice-president, William Welch; treasurer, J. T. Shinkle; secretary, R. H. Wehler; directors, W. S. Voss, Pendleton Bowers, Rudolph Lemke, Louis Putnam, James Farquhar.

KANSAS.

TURIN—The Hahne Telephone Company.

ELSMORE—The Katy Telephone Company. Capital stock, $2,800.

GALENA—Galena Home Telephone Company. Capital stock, $10,000.

DENISON—The Broken Arrow Telephone Company. Capital stock, $5,000.

COUNCIL GROVE—Council Grove Telephone Company. Capital stock, $50,000.

ARCADIA—The Arcadia and Drywood Telephone Company. Capital stock, $750.

BOW CREEK—The Bow Creek Telephone Association. Capital stock, $2,000. President, Evan Hebrew; vice-president, J. M. Elliott; secretary E. A. Stroup; treasurer, J. A. Hebrew.

MANNING—The Manning Telephone Company. Capital stock, $21,600. President, W. B. Swaney; secretary and manager, Philip Zerwas; treasurer, R. R. Williams.

KENTUCKY.

MURRAY—Calloway County Independent Telephone Company. Capital stock, $1,000.

MAINE.

SOUTH CHINA—China Telephone Company. Capital stock, $10,000. President, W. J. Thompson, South China; treasurer, F. B. Foye, China.

MICHIGAN.

WHITEFORD CENTER—The Whiteford Telephone Company.

NORVELL—The Norvell and Manchester Telephone Company. Directors, G. B. Holloday, D. L. Palmer, C. P. Bancroft and others.

ROLLO—Rollo Telephone Company. Capital stock, $20,000. Incorporators, Noel A. Kinney, Robert A. Love, C. E. French, A. L. McRae, James B. Harrison.

MINNESOTA.

MORTON—The Morton Rural Telephone Company. Capital stock, $25,000.

ROTHSAY—Rothsay Telephone Company. Capital stock, $10,000. W. J. Breen is named as one of the stockholders.

ARTICHOKE LAKE—The Farmers' and Merchants' Rural Telephone Company. Capital stock, $10,000. President, Charles Hanson; vice-president, Edward Roberson; secretary, Dietrich Schmeckpeper.

MONTANA.

HENDERSON — The Henderson Telephone Company. Capital stock, $10,000. President, Hans Enes; secretary, Alf C. Blasing.

GREAT FALLS—The Cascade County Rural Telephone Company. Capital stock, $50,000. Incorporators, C. F. Stork, Duncan Cameron, J. P. Heber, Will Conrad.

MISSOURI.

FREMONT—Dayton Central Telephone Company. Capital stock, $2,000.

HANNIBAL—Adams-Pike County and Hannibal Telephone Company. Capital stock $7,000. Incorporators, William H. Breckenridge, John W. Buttz, Samuel S. Inman and Charles H. Rankin.

NEBRASKA.

MONROE CITY—Farmers' and Merchants' Telephone Company.

KEARNEY—The Kearney Telephone Construction Company. Capital stock, $100,000.

ELGIN—The Antelope County Telephone Company. Capital stock, $60,000, and paid-up capital stock of $1,500.

NEW HAMPSHIRE.

HENNIKER—The Henniker Telephone Company. Capital stock. $40,000.

WEARE—The Weare Telephone Company. Capital stock, $3,000. The company will do business in Weare.

NEW YORK.

HIMROD—The Himrod Telephone Company. Capital stock, $2,000. Directors, C. M. Van Dyke, H. S. Voorhees and others.

BURDETTE—The Burdette Home Telephone Company. Capital stock, $5,000. Directors, H. R. Martin, M. L. Martin and S. B. Allen.

BINGHAMTON—The Sherman and Hale Eddy Telephone Company. Capital stock, $700. Directors, Charles S. Siles, H. Eddy and others.

NEW YORK—The Mears Ear Phone Co. Capital stock, $100,000.

Incorporators, and directors for the first year, W. S. Mears, L. G. Laurew, E. Lewis, New York.

CASTLE CREEK—Castle Creek and West Chenango Telephone Company. Capital stock, $500. Directors, J. M. Brooks, Castle Creek; Benjamin B. Worden, West Chenango; and W. L. Treadwell, Glen Castle.

CHATHAM—Chatham Farmers' Mutual Telephone Company. Capital stock, $10,000. President, A. B. Horst, Spencer; vice-president, P. H. Homan, Medina; secretary, W. H. Ripley, Chatham; treasurer, A. R. Clapp, Medina; manager, L. S. Rogers, Chatham.

OKLAHOMA.

FREDERICK—Frederick Telephone Company. Capital stock, $5,000. Incorporators, J. M. Bellamy, A. X. Campbell and W. C. Shaw of Lawton.

ENID—The Enid Rural Telephone Company. Capital stock, $30,000. Incorporators, R. A. Williams, J. H. Doolis, W. T. Milam, J. E. Johnson.

TRYON—Lincoln County Rural Telephone Company. Capital stock, $5,000. Incorporators, Wm. Teegarden, T. D. Rush, G. W. Howerton, A. G. Walters, J. N. Smith.

OHIO.

CHERRY VALLEY—The Cherry Valley Telephone Company. Capital stock, $1,000. Incorporators, P. D. Spofford, E. H. Phelps, and others are interested.

HALLSVILLE—The Colerain Telephone Company. Capital stock, $10,000. Incorporators, R. D. Robinson, A. L. Maag, G. H. Clark, T. P. Sylvan, E. A. Reed.

GIRARD—The Girard Telephone Company. Capital stock, $35,000 Incorporators, E. H. Stoze, J. C. Kehl, E. L. Huser, S. C. Hazen, J. G. Jones, W. J. Wallis, R. T. Izant.

AMANDA—Bell Telephone Company. Capital stock, $5,000. Incorporators, Fred L. Manger, Thomas J. Barr, S. H. Simon, Theodore Lane, E. R. Defenbaugh, John Myers.

ORRVILLE—The Gemmill Telephone and Manufacturing Company. Capital stock, $60,000. Incorporators, James Gemmill, Thomas S. Dunlap, James Nicoll, Sr., L. R. Duncan.

COLUMBUS—Franklin County Telephone Company. Capital stock, $150,000. Incorporators, Isaac B. Cameron, Seth L. McMillan, Ralph Reamer, Homer L. Rose, Charles F. Johnson. The lines will reach the villages of Westerville, Gahanna, Worthington, Galloway, Groveport, New Albany, Dublin, Hilliards, Lockbourne, Harrisburg, Reynoldsburg, Flint, Alton, Amlin, Black Lick, Brice, Central, College, Elmwood, Hayden, Pleasant Corners, Pickering and Lithopolis.

PENNSYLVANIA.

DALMATIA—The Citizens' Telephone and Telegraph Company organized. President, E. R. Reitz.

SHERMAN—The Sherman-Hale Telephone Line. Capital stock, $700. Incorporators, Charles H. Stiles of Deposit, N. N. Gardiner, Fred Kingsbury and John Thomas of Hales Eddy, B. W. Raymond, George B. Arnke and William Rockwell.

SOUTH CAROLINA.

LEXINGTON—Lexington Telephone Company. Capital stock, $1,000. Incorporators, J. E. Kaughman, A. J. Fox.

CANONSBURG—Farmers' Mutual Telephone Company. Capital stock, $30,000. Incorporators, S. N. Hopper, J. R. McPherson, B. K. McConnell, C. M. Linn, H. H. Bebout, R. G. Lutton, R. L. Munce, John Fulton of Canonsburg; R. B. Blaney, S. Otto Black, J. C. C. Peas, W. H. Martin of Washington; H. H. Mollenaur of Eighty-Four.

TENNESSEE.

HUNTINGTON—Consolidated Telephone and Telegraph Company. Capital stock, $50,000. Incorporators, J. K. Barlow and J. F. Barlow of Savannah, T. S. Hughes of Clifton, F. E. Shwab of Nashville, H. B. Stubblefield of Denson's, W. N. Sloan of Linden.

TEXAS.

CHEAPSIDE—Cheapside Telephone Company. Capital stock, $5,000. Incorporators, C. F. Carson, J. F. Elder and others.

VIRGINIA.

DAMASCUS—Damascus Telephone Association. Capital stock, $2,000.

ALEXANDRIA—The Central Mutual Telephone Company. Capital stock, $500 to $5,000. President, William M. Wheeler; secretary, B. F. A. Myers; treasurer, A. Conner.

TOLUCA—The Toluca and Fredericksburg Telephone Company, organized. President, Hugh Adie; secretary, C. A. Byrne; treasurer, the Conway Gordon Garnett National Bank of this city; directors, M. K. Lowry, N. B. Musselman, E. S. Moore, R. J. Payne, R. A. Moncure, Wesley Knight.

WISCONSIN.

AMBERG—The Amberg Telephone and Telegraph Company.

CAMBRIA—Cambria Co-operative Telephone Company. Capital stock, $1,000.

RIDGEWAY—The Ridgeway Telephone Company organized President, T. H. Arthur.

EAU CLAIRE—Shaw Telephone Company. Capital stock, $5,000. Incorporators, Charles Seguin, Ira Ives, Nels M. Johnson.

HUDSON—Hudson Prairie Telephone Company. Capital stock, $3,000. Incorporators, George Turner, Arthur McDiamid, G. E. Holden.

UNION GROVE—The Union Grove and Paris Telephone Company. Capital stock, $2,000. Incorporators, Henry Barnes, O. P Gorham, C. E. Barthoff.

JONESDALE—The Jonesdale and Hollandale Telephone Company. Capital stock, $3,000. Incorporators, A. W. Larson, George S. Robinson, James A. White, Louis Redeman and J. B. Wood.

ANNUAL MEETINGS.

CALIFORNIA.

SANTA ROSA—The Farmers' Fulton Telephone Company has elected the following officers: President, J. Eckel; vice-president, John Fraught; secretary and treasurer, James Wood.

CANADA.

MONTREAL—The Canadian Telephone Company has elected the following officers for the ensuing year: President, G. G. Hurd; vice-president, A. Adam; secretary and treasurer, A. G. Hurd; managers, W. T. Aughtred and Joseph Lemieux.

FLORIDA.

ARCADIA—The Arcadia Electric Light, Ice and Telephone Company has elected the following officers for the ensuing year: President, J. J. Heard; vice-president, C. C. Chollar; secretary and treas-&urer, J. L. Jones; manager, Ed Scott.

ILLINOIS.

OTTAWA—The Home Telephone Company has elected the following officers: President, V. J. Duncan; secretary, Wm. Colewell.

GENESEO—The Geneseo Mutual Telephone Company has elected the following officers: President, O. W. Hoit; secretary, Chas. Tomlinson.

MONMOUTH—The Monmouth Telephone Company has elected the following officers for the ensuing year: President, C. C. McClung; vice-president, J. E. Lanphere; treasurer, H. B. Smith; manager and secretary, W. J. McQuiston.

INDIANA.

NOBLESVILLE—The Home Telephone Company has elected the following officers for the ensuing year: President, Thomas Griffin; secretary, Elihu Hawkins.

ROCKVILLE—The Parke County Telephone Company has selected the following directors for the ensuing year: A. M. Adams, F. H. Stark, W. B. Thompson, Frank M. Boyd, J. B. Connelly, J. L. Swaim, E. O. Barnes.

PERU—The Peru Home Telephone Company has elected the following officers for the ensuing year: President, L. B. Fulwiler; vice-president, Jerome Herff; secretary, Dr. W. A. Huff; treasurer, Joseph Bergman; manager, Dr. J. E. Yarling.

SHOALS—The Shoals, Indian Springs and Bedford Telephone Company has elected the following officers for the ensuing year: President, Captain Monicle; vice-president, Garret McDermed; secretary, Walter Jones; treasurer, William Mitchell; directors, J. N. Sims, M. Dillman, A. A. Thompson, C. Henshaw, B. S. Stapleton, William McCane.

IOWA.

MT. PLEASANT—The Mt. Pleasant Telephone Company has elected the following officers for the ensuing year: President, W. J. Steckel; vice-president, R. S. Galer; secretary, E. E. England.

KANSAS.

ALMA—The stockholders of the Wabaunsee Telephone Company have elected the following officers for the ensuing year: President and manager, C. B. Henderson; secretary, A. S. Allendorph; treasurer, J. B. Cassidy; directors, M. F. Trivett, W. C. Schumate, O. J. Hess, C. B. Henderson, J. B. Cassidy, A. S. Allendorph, J. N. Dolley.

MARYLAND.

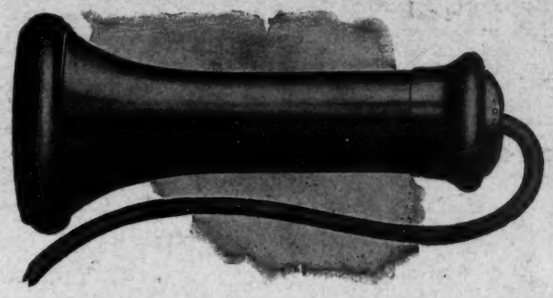
ELKTON—The Cecil Farmers' Telephone Company has elected the following directors: Elwood Balderston, Alfred B. McVey, Morris C. Reeder, Cecil E. Ewing, Jas. H. Maxwell, Joseph T.

BALTIMORE—The directors of the Maryland Telephone and Telegraph Company have elected the following officers for the ensuing year: President, David E. Evans; vice-president and general manager, H. W. Webb; assistant to president, Stanley Baker; auditor, William T. Spring.

SHEET BRASS
ALL TEMPERS
BRASS DRILL ROD
German Silver, Brass and Copper **WIRE**
BRAZED and SEAMLESS TUBING

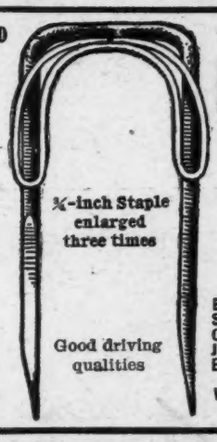
The Plume & Atwood Mfg. Co.
199 Lake Street, CHICAGO

TRADE **"SOLID"** MARK
OUR NEW STYLE H



MURDOCK, :: :: Chelsea, Mass.

SQUARE HEAD
Double fibre insulation
Securely attached
¾-inch Staple enlarged three times
Good driving qualities
PAT. NOV. 27, 1900.



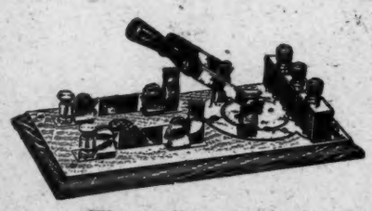
Manufactured and For Sale by
Blake Signal & Mfg. Co.
246 Summer Street,
BOSTON, MASS.
SELLING AGENTS:
ELECTRIC GAS LIGHTING CO., Boston.
SCHOEN, AUSTIN & CO., Atlanta.
CRESCENT CO., Chicago.
J. A. WHITNEY, Denver.
BROOKS-FOLLIS ELEC. CORPORATION, San Francisco.
WESTERN ELEC. CO.

NORWAY IRON
Cold Rolled Flats
Cold Drawn Flats and Rounds
Magnet Steel
GEO. NASH & CO.
Drill Rods, Music Wire, Spring Wire, Flat Wire, Bessemer Rods, Screw Stock, Cold Rolled Cyclone Spring Steel, Cold Rolled Spring and Forming Steel, Tool Steels.
224 Pearl Street, New York — IMPORTERS — 24 So. Clinton Street, Chicago

TELEPHONE SUPPLIES
INSULATORS
CROSS ARMS
BRACKETS
PINS
BATTERIES
WIRE, ETC.
RUSH SHIPMENTS. LOW PRICES. TRY US.
WRITE FOR CATALOGUE
HODGE-WALSH ELEC. ENGR. CO.
701 Delaware Street KANSAS CITY, MO.

THE H. B. CAMP CO.
Manufacturers of
"CAMP" STANDARD VITRIFIED CLAY CONDUITS.
SALES OFFICES:
85 Hartford Bldg. CHICAGO
170 Broadway NEW YORK

SOMETHING DOING! in a STORM
without a
King of Protectors



Better Buy a
"Tornquist" Combination Lightning Arrester Ground Switch Fuse and Lever Cut-Out.
The only safe protector made.
Order sample now.
HART & CO., Chicago.
GENERAL AGENTS.
Clinton Stamping & Electric Co., Clinton, Ia.

Baby Knife Switches
Stamping and Plating.
Sold by all Jobbers.

AMERICAN ELECTRIC TELEPHONE CO.

CHICAGO

AUTHORIZED CAPITAL THREE MILLION.

LARGEST MANUFACTURERS IN THE WORLD.

WRITE FOR CATALOGUES.

AMERICAN ELECTRICAL WORKS

OUR SPECIALTIES,

TELEPHONE WIRES AND CABLES

CHICAGO, 82 Lake St. PHILLIPSDALE, R. I. NEW YORK, 26 Cortlandt.

Telephone Engineers and Contractors

All Branches of Telephone Construction

Rebuilding of Small and Medium Sized Exchanges a Specialty. We put them on a Dividend Paying Basis.

Write for our plan.

Wheeler Electric Construction Company

Plymouth Building, F. H. WHEELER, Prop. CHICAGO

W. H. CRUMB & COMPANY

ENGINEERS—CONTRACTORS

Telephone Engineering and Construction

Meritorious Independent Telephone Enterprises Financed

TELEPHONE HARRISON 2543. 1263 Monadnock Building, CHICAGO

Telephone Material

Grow. Conover

Get my proposition before buying. I can save you money.

Purchasing and Forwarding Agent for INDEPENDENT Telephone Cos.

Suite 1112, 135 ADAMS STREET, CHICAGO, ILL.

J. F. BUTTERFIELD,

Electrical Engineer and Contractor

Complete Telephone Exchanges Built and Material Furnished.

Cable Construction and Underground Conduit Construction a Specialty.

Room 535, 113 Adams Street, - - - CHICAGO, ILL.

BELDEN MFG. CO.

MAGNET WIRES

COPPER—GERMAN SILVER

SIZES 14 TO 40

SELF FLUXING SOLDERS

ROSIN AND TALLOW CORE

We specialize in the manufacture of the finer sizes of magnet wire.

TELEPHONE SWITCHBOARD WIRES

IN VARIOUS WRAPS AND COLORS.

SINGLE OR PAIRED—BEESWAXED.

COIL WINDING MACHINES

118 MICHIGAN STREET, - - CHICAGO

LE ROY W. STANTON

CONSULTING TELEPHONE ENGINEER

Plans, Specifications, and Supervision of Installation of Complete Telephone Plants

SPECIAL REPORTS ON TELEPHONE PROPERTIES AND APPARATUS

411 Electrical Bldg., CLEVELAND, OHIO.

Benedict & Burnham Brass and Copper Co.

BRASS, COPPER & GERMAN SILVER

in Sheets, Rods, Wire and Tubes

A large stock carried at our Warehouse

211-213 Lake Street - - Chicago

J. W. Middleton & Co.

PUBLISHERS OF

The Inter-State Corporation Record

Containing All Forms and Blanks For Organizing a New Corporation.

Stock Certificates, Bonds, Corporate and Notarial Seals, Blank Books, Printing, Lithographing.

167 Dearborn Street, CHICAGO.

Telephone Stock Certificates

Chicago Insulated Wire Co.

Hard and Soft Drawn Copper Wire.

Double Galvanized Telephone Wire.

Bare and Insulated Wire.

Galvanized Strand Wire.

FACTORY: SYCAMORE, ILL. 154 Lake Street, CHICAGO

FIBRE CONDUIT COMPANY

WORKS & PRINCIPAL OFFICE ORANGEBURG, N. Y.

UNDERGROUND CONDUIT

RIGHT IN THEORY — RIGHT IN PRACTICE — RIGHT IN PRICE

LAST, BUT IN THE LEAD ON A PERFECT APPARATUS

FOR

ANTI-TRUST ANTI-MONOPOLY INDEPENDENT TELEPHONE SYSTEMS CENTRAL ENERGY GENERATOR CALL

All We Ask is Your Request for Samples and Quotations.

INTERNATIONAL TELEPHONE MFG. CO., Harrison and Clinton Sts. CHICAGO, U. S. A.